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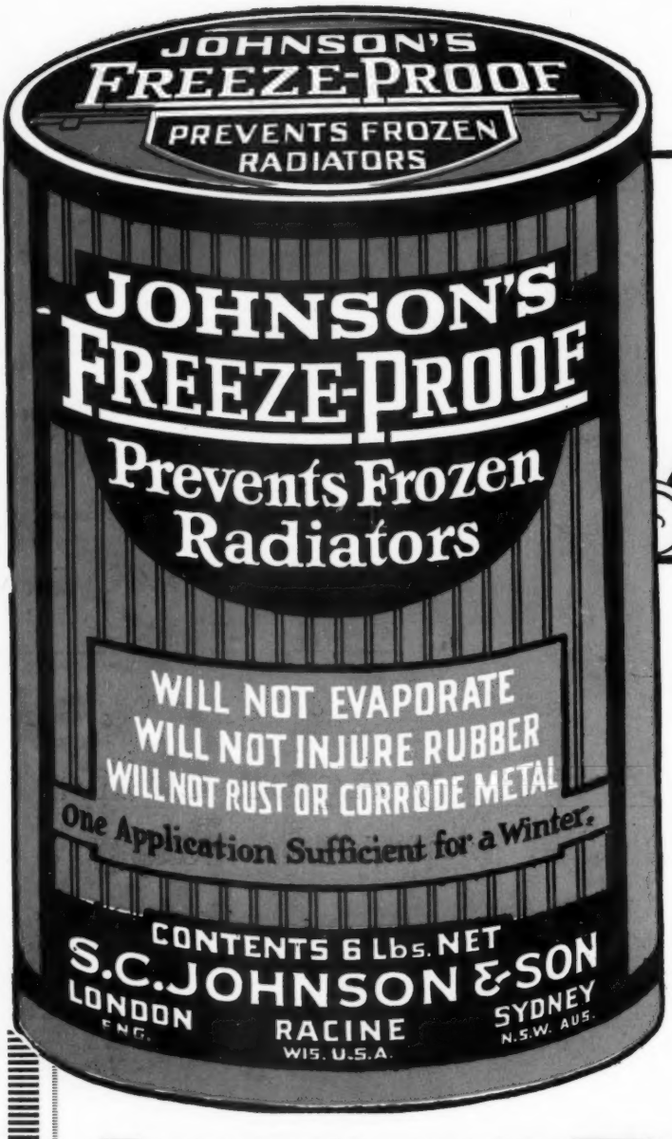

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXIX NEW YORK, THURSDAY, SEPTEMBER 26, 1918—CHICAGO No. 13

Gear Makers Decide on Closer Co-operation

Comprehensive Standardization Plan Involving All Types of Gears Started—Increasing Production and Man-Power Conservation the Great Issues

By P. M. Heldt

SYRACUSE N. Y., Sept. 21—Getting their complete organizations co-operating to the highest efficiency under war conditions, and complete co-operation with the Government in its war activities, constituted the keynote of the semi-annual convention of the American Gear Manufacturers' Association, which was concluded here to-day.

Not an address was made during the 3 days of the meeting that did not contain some reference to war conditions and ways of meeting them, and a spirit of patriotic fervor pervaded many of the speeches made at the social gatherings.

A representative of the War Industries Board, Charles A. Otis of Cleveland, chief of the Resources and Conversion Section, came to Syracuse to talk regarding plans adopted for the conversion of plants and equipment engaged in non-essential industries to suit them for essential work.

Some conception as to how the members of the association can co-operate with the Government was given by President F. W. Sinram, when he told of the endless ramifications of the use of gears. There are gears in every ship, every airplane, every submarine, every truck, every military tractor, every farm tractor, every motorcycle, every steam shovel, crane, gasoline locomotive, trench engine, gun, gun-mounts, and gears are in use in all mines, mills, and much electrical equipment. At present 80 per cent of all gear work is war work.

This broad use of gears going into industries very often not closely related and not having common interests points to the great necessity for standardizing in order that production be kept at its highest percentage and man-power be conserved as much as possible.

President Sinram emphasized the fact that few gears are purchased directly by the Government, yet gears invariably form parts of all complete war machines in use.

"The requirements of the nation," said President Sinram, "predominate over every other consideration. It devolves upon every gear producer to apply his plant and equipment where it will fit into the general requirements to the best advantage. Production is the need of the hour. Co-operation between those operating in the same field is demanded by the present. This has become a patriotic duty and is not only encouraged, but expected by the Government.

"We live in a new era. Standardization is not

only encouraged and recommended by the Government, but the latter has seen fit to command it in certain industries in the interest of conservation, production and economy. Our program for technical standardization is gradually taking shape. It should receive considerable impetus during this meeting. Let all concerned keep ever at it during the ensuing 6 months in order that the current association year may record material progress. Standardization is important to the future of the industry.

"Another phase of standardization—commercial—is receiving consideration; uniformity of practice is desirable in many connections. The sessions of this meeting may open the way for a step forward in this direction.

"Perhaps a few statements of facts pertinent to gear production may suggest what is necessary from the different angles for satisfactory performance on the part of the industry.

The Importance of Gears

"1—There is no finished product more vital to the war than gears.

"2—The production of gears is a technical, highly specialized business. Efficiently conducted it demands in personnel ability—commercial, technical and mechanical—of a high order.

"3—Many phases of gear production demand skilled workers to an extent not required by the average metal working industry.

"4—A large fixed investment—plant, machinery and tools—is required for any considerable scope and volume.

"The requirements of the nation are paramount to every other consideration. It devolves upon every gear producer to apply his plant and equipment where it will fit into the general requirements to the best advantage. Production is the need of the hour.

"Co-operation, as never before, between those operating in the same field is demanded by the present. This has become a patriotic duty and is not only encouraged, but expected by the Government.

"We live in a new era. Standardization is not only encouraged and recommended by the Government, but it has seen fit to command it in certain industries in the interest of conservation, production and economy.

"Another phase of standardization—commercial—is receiving consideration; uniformity of practice is desirable in many connections. The sessions of this meeting may open the way for a step forward in this direction.

"Summer is over. Our meeting here to-day marks the opening of the fall and winter season. It is also expected to represent the start to renewed activity in every phase of association endeavor."

How Gear Makers Can Co-operate

The most tangible way in which the gear makers can cooperate with the government, by increasing production and conserving man-power, is along the lines of standardization, and a complete program for pushing standardization work was outlined and an organization of committees to carry this work out arranged for. This was followed up by instructions to all the committees on the work to follow in this field. B. F. Waterman, chairman of the General Standardization Committee, has this work in charge, and his program has in mind considering the design of gears so as to evolve rules and formulas which will make it possible for all of the forty-seven members of the gear association to manufacture approximately the same product.

This program, outlined in detail later, arranges for the consideration of the design of all types of gears, so that different makers can produce approximately the same design; and it also involves a standard specification sheet for use in contracts and orders.

Still another example of how the members of the association may co-operate as a war conservation measure was suggested by Frank Burgess of Boston, when he reported on the possibility of one maker loaning hobs to other companies. At present there are over 1800 hobs owned by the membership and scarcely more than one-third of these are in constant use. By the loan suggestion it would be possible to keep these in use a much greater percentage of the time.

The association appointed a War Service Committee, which it is expected will be a fit method of association representation on matters with the government.

The increasing use of women in gear factories and the high efficiency of these was one factor of the meeting. W. H. Diefendorf gave a special address on this subject.

The advantages of housing workmen under war conditions was well outlined by C. V. Stuart, who told of the results obtained by one of the steel companies in this field.

The report of the membership committee showed that three well-known gear concerns had applied for membership in the association, and their applications were accepted. The new members are the Cullman Wheel Co., Chicago, the Brown-Lipe Gear Co., Syracuse, and the Indianapolis Tool & Mfg. Co., Indianapolis. This brings the number of concerns represented in the association to 47.

B. F. Waterman, chairman of the General Standardization Committee, presented a committee report. Between the White Sulphur Springs meeting last April and the present meeting the committee held two meetings at which the conclusion was reached that certain items in gear design and manufacture were ripe for standardization. Sub-committees have been or will be appointed to deal with the following classes of gears, respectively: Bevel, spur, worm and spiral herringbone, composition gears and sprockets. There will also be a hardening and heat-treating committee and a committee on gears and pinions for electric railways and mines.

Instructions were issued to each committee outlining the subjects which it should deal with from the standpoint of standardization, as follows:

Recommendations for Standardization

To the Bevel Gear Committee

1—We think it well to consider the design of gears with the idea of evolving rules and formulas enabling all members to turn out approximately the same product. As each sub-committee representing a type of gear will work on the subject of design, there should be consistency in all formulas.

2—Formulas for strength of gear teeth and the relation of strength to wear.

3—Adopt a standard long addendum for straight tooth bevel gears and consider a modification of addendum and dedendum to agree with the correct or normal pitch as is practiced in helical spur gears.

4—Make up a standard specification sheet for use in contracts and orders.

To the Spur Gear Committee

1—We think it well to consider the design of spur gears with the idea of evolving rules and formulas enabling all members to turn out approximately the same product. As each sub-committee representing a type of gear will work on the subject of design, there should be consistency in all formulas.

2—Develop a formula for the strength of spur gear teeth and the relation of strength to wear.

3—Make up a standard specification sheet for use in contracts and orders.

To the Worm and Spiral Gear Committee

1—Rules for the design of worm gears enabling all members to turn out approximately the same product.

2—Formulas for the strength of worm gears and the relation of strength to wear.

3—A specification sheet for use with contracts and orders whereby customers and maker will know just what will be produced.

Committee on Composition Gearing

1—Standard methods of construction advised by manufacturers of this type of gearing.

2—Standard methods of handling the material to prevent absorption of moisture.

3—Strength formulas for various kinds of material used in this type of gearing.

4—Best methods of cutting and the speeds and feed permissible.

5—Tabulate successful long-lived drives, giving full details, such as full load, intermittent load, speeds, etc.

6—Make up standard specification sheet for use in contracts and orders.

Hardening and Heat Treating Committee

1—Depth of case and its relation to pitch and service.

2—Materials and treatments suitable for different services.

3—Standardizing scleroscope and Brinell readings.

Herringbone Gear Committee

1—Formulas whereby members will produce gears approximately of the same design and where others interested might do so.

2—Formulas for strength of herringbone gears and the relation of wear to strength.

3—Tabulate successful designs giving details.

4—Get up a specification sheet for use with contracts and orders whereby customer and manufacturer will understand just what is to be furnished.

The Sprocket Committee

1—Evolve formulas for dimensions of hubs, arms and rims, having in mind the design of spur wheels which are now being considered by the spur gear committee.

2—Another matter that was brought up was the question of when small sprockets should be hardened. Some standard practice might be determined here by working in conjunction with the chain manufacturers. A table of the strength of various kinds of chains with the safe working speeds would be useful. This data, of course, must be obtained from the chain manufacturers. (A copy of a letter received from the committee on Steel Roller Chains of the American Society of Mechanical Engineers in which they agreed to co-operate was sent to each member of this committee).

Electric Railway and Mine Committee

1—Evolve rules and formulas whereby all members will turn out approximately the same product. As each sub-committee representing a type of gear will work on the subject of design, there should be consistency in all formulas.

2—Develop formulas for the strength of gear teeth and the relation of strength to wear.

3—Make up a standard specification sheet for use in contracts and orders.

Each list of subjects was accompanied by the following comment:

"In undertaking this work it seems advisable to limit ourselves somewhat in the number of subjects that we consider so that we will have a better chance of concentrating and finishing up the various subjects; it may be that the committee will decide that these be considered in a different order than given or that something else is of more importance, when they will feel free to take it up, although we trust that the sub-committees will keep the General Standardization Committee in touch with what they are doing."

The report of the committee on commercial standardization, which is drawing up specifications which are to accompany all bids and contracts for gears, was not quite ready, but William Ganschow of Chicago, a member of this committee, read an outline of the items to be covered. It is proposed to submit the revised specifications to the membership for comment once more before putting it up for a vote.

The Hob Exchange Plan

Frank Burgess of Boston read a preliminary report of the hob exchange committee. The idea is that a tabulation shall be made of all hobs owned by members, with a note as to whether they are willing to loan them to other members under conditions agreed upon. A survey made shows that over 1800 hobs are owned by member companies and that not more than one-third of them is in even fairly constant use. The plan has the hearty approval of several members and is directly in line with the conservation movement.

John B. Foote of Chicago made a comprehensive report for the labor committee. The following war service committee has been appointed to represent the gear industry: F. W. Sinram, chairman; S. L. Nicholson, vice-chairman; Frank Hamlin, secretary; Frank Burgess, H. W. Chapin, James E. Gleason, F. T. Zollinger, T. G. Meachem, E. J. Frost and William Ganschow. The personnel of this committee was approved as being well selected both as regards branches of the gear industry and sections of the country.

On Thursday evening the members and others in attendance were the guests of the Brown-Lipe Gear Co. and the Brown-Lipe-Chapin Co. at a dinner given at the Onondaga. The affair was a very enjoyable one.

During the Friday morning session W. H. Diefendorf of the New Process Gear Corp. read his paper on the employment of women in the gear industry. Mr. Diefendorf said in substance:

"For years back we had observed women employed in the mechanical arts, not only in light and intricate work, such as inspection, watch making, but also operating machines working on fairly heavy and sizable parts, which latter practice, I believe, was carried to a much greater extent abroad. We, therefore, decided to try the experiment in one of our gear cutting departments on some of our lighter work. The results justified our hopes and we proceeded to extend the system to cover other sections and departments, which enabled us to supply the necessary quota of operatives at a time when they were badly needed.

"Recent visits to plants producing war material revealed the fact that women are now being employed, not only on grinding operations, light lathe work, etc., but also on heavy work, such as the milling of engine bases, as well as on certain portions of engine assembly. Naturally the positioning of heavy parts requires the use of chain hoists and the aid and guidance of male overseers and assistants. In the light of such facts it is apparent that women operatives *can* be used in the heavier as well as the lighter varieties of gear work, though probably the logical field for such help is in connection with the blanking and cutting of small gears on a piece work basis where the operative receives a financial return for her labor commensurate with her application and her natural ability.

"Women also make excellent inspectors, their delicate touch—more sensitive than that of men—aiding them in detecting imperfections when giving the gears a rolling test, and this, coupled with their quick eyes and nimble fingers, gives them an advantage in gaging and visually inspecting finished parts.

"War conditions have, of course, accentuated the seriousness of the labor problem and with the close of hostilities, in all probability, many of the women now employed in the mechanical trades will return to their former status, but it does not seem at all probable that, having become accustomed to a fat pay envelope, they will willingly go back to the less lucrative field of housework, etc. Consequently, so long as there remains a demand for operatives at good wages we may expect to see woman a keen competitor of man and in certain lines running in the forefront of the race, resulting in a condition which, if continued, will undoubtedly force upon the community the consideration of such things as communal homes, communal kitchens, etc.

"To my mind there can be but one reply to the question in hand, which is that the up-to-date gear maker not only can but should accord to woman a place among his operatives."

Mr. Otis, of the War Industries Board spoke for several hours, dwelling upon the great shortage of steel which is due to a shortage of coal that results from lack of sufficient manpower; and he insisted upon the absolute necessity that the steel requirements of the fighting forces be met first.

The Steel Outlook

At the final meeting this morning C. E. Stuart of the Central Steel Co., Massillon, Ohio, gave a talk on The Outlook of the Steel Supply. He read a letter from J. L. Replogle in which were given the estimates of steel production and war requirements which have already been published. These, as is known, leave a deficiency of 6,000,000 tons for the current 6 months. Fortunately this is only a "paper" deficiency and various things will tend to lessen the actual consumption for war purposes.

Mr. Stuart also dwelt on the labor situation and described some methods employed by his firm to increase the efficiency of their labor. Working in co-operation with a land company the concern has invested $112,000 in bunk houses for laborers close to the steel mills. Each contains a cot and bed. The bed is properly made and the house swept out during the day, so that when the tenant arrives in the evening he finds it neat and tidy. Formerly many of the foreigners employed at the mills roomed at a considerable distance outside the city, where, it was found, they were subject to baneful influences. Now, with the men close to the factory, on the addition of the land company, they are under police supervision furnished by the company. A refrigerating plant was installed and each workman is allowed a limit of three bottles of beer a day. The investments thus made have resulted in an appreciable increase in efficiency and the workmen are encouraged to and do buy the houses after they find they like the place.

Another paper read during this session, by C. E. Crofoot, was on "Trade Acceptances." Mr. Crofoot favored the use of trade acceptances in the gear industry and the recommendations made in his paper were referred to the committee on commercial standardization.

Useful Data From Harrisburg Tests

Tractor Demonstration, Staged by Department of Agriculture, Gives Valuable Performance Information—Plow on Basis of Advertised Capacity

HARRISBURG, PA., Sept. 24—A commendable effort to stage tractor demonstrations that will furnish useful tractor performance data for such agricultural areas as Pennsylvania was carried out by the Department of Agriculture of this state during the last 4 or 5 days.

The demonstrations were originally scheduled for September 19, 20 and 21, but owing to rain the program was entirely upset and the demonstrations were not completed until tonight. Unfortunately two or three of the contestants had made other arrangements at Pennsylvania county fairs, and they had to withdraw their tractors when the demonstrations were scarcely one-third over.

These state demonstrations were not spectacular; only fifteen different models of tractors competed, but they were epoch-making in that a close record was kept on all of the work done. Machines were given approximately 2 continuous days at plowing, followed by a fraction of a day on fitting the soil for winter wheat, and seeding.

Observer on Each Tractor

During every stage of the demonstration each tractor was accompanied by an official observer who recorded the exact time required for the particular work; the number of stops made, and the length of each, and information as to whether these were due to troubles with the tractor, or with the plow, or other equipment; they also reported the exact amount of fuel consumed by each tractor in each of the jobs to which it was assigned.

All of this information is not as yet available but will be given out by the Department of Agriculture in the next week or 10 days. One report has been given out to date which covers a 3-hr. period of plowing on typical Pennsylvania land. This report, published herewith, contains much valuable information on the performance of the tractors, particularly on smaller areas than that plowed at the national demonstrations.

The plowing was done in a 42-acre field measuring approximately 76 x 90 rods; the furrows were 76 rods in length. Two-thirds of the ground was clean sod, and the one-third an old corn stubble in which the weeds were 3 ft. in height. All of this ground was very hard until 2 days previous to the demonstrations when it was brought into good plowing condition by the heavy rains.

Accurate Information Sought

One of the purposes of the Pennsylvania Department of Agriculture in staging these demonstrations was to secure an accurate line of information on what different tractors would do under Pennsylvania conditions. The Pennsylvania farmer does not question what a tractor will do on the prairie stretches of Kansas, but he has the Missouri instinct with regard to what it will do on the hills and among the stones of his own state. The Pennsylvania farmer also has some peculiar ideas as to how farming must be done in his locality and he is doing his best to discover the capacity of the tractor to meet his local requirements.

He also feels that the rate of plowing which is possible in the western states is not possible in Pennsylvania. He is further of the opinion that fuel consumption in his state is higher than that in the West.

The 3 hr. of plowing, which is covered by the report herewith, is not a complete answer to this question, and several more demonstrations of this nature will be required before accurate figures are obtained. For example, in the field plowed there were no stones, although in the fields not covered by this report, much time was lost by stones. The field covered in the present portion of the report is practically level and so gives no clue as to the performance of tractors on hilly ground. Hilly conditions were encountered but the report on them is not ready.

Test Based on Advertised Capacity

The tabulation herewith is based on each tractor plowing in a 3-hr. period the amount it is supposed to plow according to the advertising of the manufacturer. In laying out the plot for each tractor, the area allotted was based on the speed of the tractor in m.p.h., the number of plows, and the width of the plows.

A definite area was staked out for each tractor and this is given in the fifth column of the tabulation, which is headed, "acres plowed." The assumption was that all of the tractors should plow their respective area in 3 hr. flat, providing they averaged the speed given in the entry blank. This had to include all of the time consumed in turning at either end of the field.

As to how close the different contestants came to this schedule is shown by the fourth column from the end headed "gross time." The figures are given in hours and minutes. This gross time includes time lost for stops due to the tractor and also the plows as given in the last two columns. From this it will be seen that only one tractor finished ahead of its 3 hr. schedule. This was the Frick, which was 3 min. ahead of schedule. This tractor in doing its plowing had lost 2 min., 1 min. for tractor stop and 1 min. for a plow stop.

Many Closely Approached Time Limit.

There were several other tractors that approached closely to their plowing schedule, or as in this case, nearly finished their plot within the 3-hr. period. The Parrett was 5 min. over its schedule. This machine had to plow in the corn stubble which was knee high with weeds and if the recorded plow stop were eliminated, its net plowing time was only 2.5 min. above the 3-hr. schedule.

The new International four-cylinder tractor, using a vertical engine—this tractor has not been seen in western demonstrations—had to operate through the same weeds that the Parrett did, and it finished 5 min. ahead of its schedule, or in 2 hr. and 55 min. It lost 6 min., due to plow stops, so that its real net plowing time was 2 hr. and 42 min. or approximately 17 min. under its entered speed. It entered at 2.5 m.p.h. speed and performed at 2.54 m.p.h.

There were other tractors that came close to finishing on the 3-hr. schedule. The Case 9-18 model finished in 16 min. over the 3 hr. The International Harvester Titan model was only 8 min. over the 3 hr., and if a 4-min. plow stop is deducted its net plowing time was but 4 min. over the 3 hr.

The Waterloo Boy finished in 3 hr. and 13 min., or 13 min. above schedule. Allis-Chalmers finished 13 min. above schedule. The Huber was 23 min. above schedule.

Real Reason for Delays

There were very legitimate reasons why some of the tractors could not plow on schedule. In this connection the work of the Cleveland must be noted. It was the lot of this tractor to draw a very bad section of land, part of which was made up of a rough fence bottom extending from one end to another of its area. The fence had only been removed the day previous and it was almost impossible to keep the plows clean during several rounds while this was being plowed. Over two-thirds of the ground the Cleveland had to plow was overgrown with weeds, which delayed the work. This tractor was entered to plow at 3.5 m.p.h. and its actual speed worked out at 2.54.

There were some of the other tractors which did not per-

form up to their rated speed for different reasons. In some cases the machines were fresh from the factory and were not sufficiently worn in to put up the supreme test.

In the tabulation the tractors that had to plow on the corn stubble overgrown with weeds were the Emerson-Brantingham, Knickerbocker, Parrett, I. H. C. and Cleveland. The Reed tractor withdrew after making a round or two due to clutch troubles.

The Knickerbocker is a Ford attachment in which a special rear axle with heavy wheels is fitted to a touring car body. It had a severe test, as its entire plowing area was in the weedy section.

The Emerson-Brantingham was the only tractor to haul four plows.

Fuel Consumption Figures Valuable

The fuel consumption figures, while accurate and valuable, are perhaps not sufficiently comprehensive to be taken as a Pennsylvania criterion. They are, however, the best figures available, and give a pretty good indication of what can be expected. With those tractors using kerosene the consumption per acre is over 3 gal., with the exception of two machines, namely, the Emerson-Brantingham, which pulled four plows, and the Frick, which pulled three plows.

These fuel consumption figures were quite amazing to many of the contestants, who imagined they would not use so much kerosene. One grade of kerosene was used, which was the standard grade sold in Pennsylvania. All tanks were filled from the same tank wagon. These fuel figures do not include the gasoline used for starting. In some cases a good deal more gasoline was used than was required for starting.

For example, the Emerson-Brantingham used over 4 gal. of gasoline, or very close to a gallon per acre, in addition to its kerosene, so that its low kerosene consumption figure must only be read in connection with the gasoline used as well. This does not apply to the Frick, which used a very small quantity of gasoline, approximately 1 pt.

There were three tractors that used gasoline entirely. These were the Cleveland and the Moline, both of which pulled two-bottom 14-in. plows, and were entered at a speed of 3.5 m.p.h. The Moline did its plowing in sod, whereas the Cleveland had the corn stubble and the rough fence bottom. The fuel consumption of these two was remarkably close, Moline averaging 3.18 gal. per acre and Cleveland 3.21. Had both been working on the same class of soil, it is questionable which would have shown the better performance. The net plowing time of the Cleveland was 3 hr. and 47 min. and that of the Moline 3 hr. and 55 min.

Generally speaking, the fuel consumption for those tractors using gasoline was under that of those using kerosene, the Frick being the single exception. The average of gasoline per acre was pretty close to ½ gal. less than that of the average of kerosene.

There were remarkably few stops due to tractor troubles, the Reed being the only serious case. The Knickerbocker or Ford had 45 min. checked against it for tractor stops, much of which was due to repairing the fan belt. The majority of the other tractor stops were due to changing spark plugs, tightening terminals, repairing fan belts, and adding water to the radiator.

Although no official record was kept of the oil consumed, all of the tractors filled up before starting, and one or two were compelled to add oil to the engine before the 3 hr. were up. The rules had contemplated keeping a record of the oil but it was wisely decided not to do this. When many of the tractors drew off the crankcase oil at the end of the period it was badly thinned, undoubtedly due to kerosene getting past the pistons into the case.

In connection with the consumption of oil in a tractor engine, it would seem best to make a distillation test of the lubricant in the crankcase after the test to show the percentage of kerosene. This has been done with motor trucks and valuable results have followed. It would appear to be the only accurate means of ascertaining how successfully the kerosene fuel has been burned. Such distillation tests would furnish valuable information for the tractor industry.

The rules and regulations governing the demonstrations were very simple. It was required that each tractor should, as stated, plow at its rated speed, and do this at a depth of 6 in. The different entrants drew for positions on the field. After the day's work was done the tractors were packed under military guard.

The Pennsylvania Department of Agriculture selected as observers what are known as county agents. These are generally college graduates, resident in the different counties, and employed by the state to give advice in the county on all questions relating to agriculture. Many of these county agents have staged the conventional 1-acre plowing demonstration during the past few months, and many others are planning to have similar demonstrations next spring.

State Purchased 35 Tractors

The State of Pennsylvania, through the Department of Agriculture, purchased last spring thirty-five tractors of different makes, and has been operating these in different sections of the state. The Department of Agriculture has daily reports on the work of these and it is largely because of this that the present demonstrations were decided upon.

It is expected next week to publish reports showing the fuel consumption for plowing on hilly soil containing some stones, and other reports showing the fuel consumption required in fitting the ground for winter wheat and seeding it.

Many of the county agents who acted as observers are of the opinion that if tractor demonstrations in Pennsylvania are to carry real conviction to the farmer, they must plow and cultivate as is considered best. There are those who are asking for plowing 8 to 10 in. deep and turning a furrow 10 or 12 in. wide instead of 14 in. They claim that you cannot do proper plowing with a 14-in. furrow unless the depth is more than 6 in., as called for in the present demonstrations. The 6-in. depth is satisfactory for winter wheat, but is not satisfactory for spring plowing.

Pennsylvania State Tractor Demonstration Record Results of a 3-Hour Plowing Test

Name	Rating	Plows No.-Size	Entered Speed, m.p.h.	Actual Speed, m.p.h.	Acres Plowed	Acres per hr.	Gals. Kerosene per Acre	Gals. Gasoline per Acre	Total Kerosene, Gals.	Total Gasoline, Gals.	Gross Time, Hrs. Min.	Net Time, Hrs. Min.	Tractor Stops, Min.	Plow Stops, Min.
Emerson-Brantingham	12-20	4-14	2.33	1.74	4.855	0.984	2.033	0.915	9.875	4.406	4:56	4:15	2	39
Knickerbocker	22	2-12	2.50	1.66	1.908	0.403	....	2.817	....	5.375	4:44	3:59	45	..
Reed	12-20	2-14	2.50	....	....	....	....	....	....	....	....	....	..	..
Parrett	12-25	3-14	2.375	2.31	3.030	0.983	3.790	....	11.500	0.125	3:05	3.02.5	..	2.5
I. H. C.	8-16	2-14	2.50	2.54	2.121	0.719	3.830	....	8.125	0.125	2:55	2:49	..	6
Cleveland	12-20	2-14	3.50	2.48	2.970	0.701	....	3.210	....	9.750	4:14	3:47	8	19
Case	9-18	2-14	2.25	2.06	2.190	0.670	3.200	....	7.000	0.500	3:16	3:16	..	..
Huber	12-25	3-14	2.50	2 21	3.180	0 939	3.010	....	9.562	0.500	3:23	3:16	..	7
Titan	10-20	3-12	2.50	2.39	2.727	0 870	3.483	....	9.500	0.062	3:08	3:04	..	4
Plowman	15-30	3-14	3.00	1.89	3.819	0 741	3 930	....	15.000	1.1875	5:09	4:45	15	9
Plowman	13-30	3-14	2.33	1.76	2 970	0.713	3.130	....	9.310	0.375	4:10	3:58	3	9
Waterloo Boy	12-25	3-14	2.25	2.09	2.862	0.889	3 140	....	9.000	0.250	3:13	3:11	..	2
Frick	12-25	3-14	2.33	2.33	2.925	0.991	2.307	....	6.750	0.187	2:57	2:55	1	1
Allis-Chalmers	10-18	2-14	2.25	2.09	2.190	0.680	3.800	....	8 440	0.625	3:13	3:08	..	5
Moline Universal	9-18	2-14	3.50	2.57	2.970	0.727	....	3.180	....	9.437	4:05	3:55	2	8

Purchasing Agents Discuss Priority

Representative of War Industries Board Explains Its Desire to Be Helpful—Over 400 Attend Banquet

DETROIT, Sept. 23—(Special to AUTOMOTIVE INDUSTRIES).—Five hundred purchasing agents from all lines of industries gathered at the Pontchartrain this morning to attend the opening session of the annual convention of the National Association of Purchasing Agents. With a gathering representing several billion dollars' worth of purchasing power annually, the convention is one of the most significant gatherings yet held by this rapidly growing association.

Registered delegates represented the biggest manufacturing concerns from Connecticut, California, Michigan, Illinois, Indiana, Missouri, the Atlantic Coast, centering at New York; western New York State, Ohio, Pennsylvania, and other sections of the country.

There were eighteen delegates from Philadelphia, seven from Springfield, Mass.; seventeen from Connecticut, eleven from Rochester, four from Dayton, twelve from Toledo, six from St. Louis, six from Milwaukee, twenty-two from Buffalo, thirty-six from New York, twenty-five from Pittsburgh, seven from Columbus, seventy-three from Detroit, fifty from Cleveland, thirty-nine from Chicago, seven from central Indiana and the remainder from miscellaneous sections of the country as far west as the Pacific Coast.

More Than 400 In Attendance

More than four hundred members attended the annual banquet, Sept. 24, an event which is felt by the members to mark another great forward stride in the growth of this young but powerful organization. A strong address by Albert C. Ritchie, Counsel for the War Industries Board, who told the real meaning of priorities, and the causes back of the work of the board, was one of the important features.

Our raw materials are plentiful but not inexhaustible, Albert C. Ritchie, who is attorney general of Maryland as well as counsel for the War Industries Board, told the members of the association. Mr. Ritchie represented the War Industries Board and was assigned to deliver a message from the Board by Chairman Bernard M. Baruch.

Steel unfortunately happens to be the material which is shorter than others, yet in addition to being needed in the war it is needed in practically all industries. Our resources must be first for war and then for industry, and it is part of the work of the War Industries Board, as defined by Mr. Ritchie, to see that the various divisions of war work secure the proper amounts of raw materials in the correct relative quantities and then to see that the industries get the material in the quantities in accordance with the war program of the government.

Our allies are calling upon us heavily and we must support them because their work is the same as ours. For this reason the War Industries Board must make a study of the material situation in every particular and first see what the requirements for war are, and then apportion what remains to the industries.

The Board has at work approximately 1500 men, all directed by the seven members of the Board who are the division leaders. These men have made amazing savings by cutting down the number of different models or styles of product in practically every line of industry. They have entered shops and suggested better methods of production and have gone to factories in work not useful to winning the war and turned them over to war work.

ALBERT C. RITCHIE
Attorney-General of Maryland and Counsel to War Industries Board

Mr. Ritchie cited building materials as a typical example. He said that the total amount of steel manufactured in the United States during the past six months was 17,000,000 tons, while the war program called for 21,000,000 tons. The steel is also needed for bridges, buildings, rails and any of a great number of industrial purposes. For this reason the work of the Priorities Committee on this subject alone presents problems of greatest delicacy.

Talking of priority, Mr. Ritchie said it is not only necessary to determine if the firm is making war material alone. The degree of importance of these war materials must be properly graded so that they will arrive in the proper sequence. Of the steel available, General Pershing demands enough for railroads to support the advance of the armies. Mr. Schwab wanted the steel for ships in order to keep the line of communication across the ocean unbroken. Mr. McAdoo demands the steel for rails and locomotives on this side of the water because the lines of communication begin here.

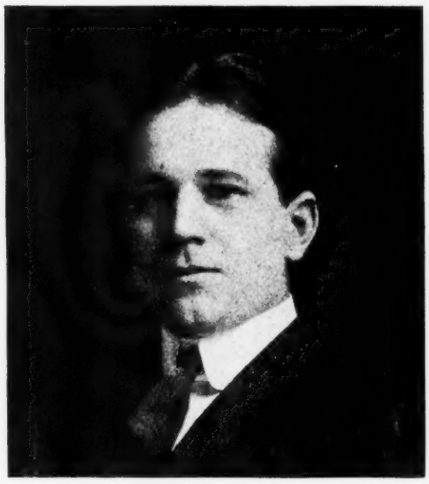
How Priority Applies

It is the duty of the manufacturer, according to the War Industries Board, to give precedence in manufacture to orders which carry the highest priority rating, so that these ratings apply not only to transportation of materials but also to their course through production.

The War Industries Board is, of course, concerned with many matters outside of priority. There is also the work of price fixing and conservation. The industries have welcomed the efforts of the Board in both these directions and called the Board in to help them in their problems. The number of buggy models, for example, has been cut down to two instead of hundreds which previously existed. The number of automobile tire sizes is being reduced to nine. Another great division, headed by Mr. Otis, studies plants and their equipment for the purpose of changing them over to war work if they are not engaged in some essential industry.

Mr. Ritchie recommended that all those concerned in any way with priority problems write to the Board for publications which are now printed on the subject. The inquiries should be addressed to the secretary of the Board, and these

William Gugenheim,
Bauer Bros. Co., Springfield, Ohio



W. P. Ogden

Herbert E. Cass,
Merrett Soule Co., Syracuse

booklets will clear up many of the questions which are now being asked regarding the manner of handling priorities.

Above all, the speaker explained, the Board is not so much a regulating body as a co-operative one, and it wants the people who are working with these problems to send their men to Washington to get in touch with the divisional heads of the Board to discuss their problems.

Priorities was the subject principally under discussion at the Tuesday meeting. That purchasing agents are greatly puzzled regarding the handling of priorities was evident.

A committee was appointed to draw up a resolution that the sub-contractor be allowed to have the same priority classification as the first contractor. This action is sufficient to show how little informed buyers really are regarding the manner of using priorities, because it has frequently been pointed out in Washington that the sub-contractor has the same status as the main contractor in priority.

W. H. Ogden of the Scovill Mfg. Co., Waterbury, voiced the sense of the meeting when he stated that the Government is screwing the lid down tighter and tighter and everyone must arrange their business so that they are helping the cause.

Another member stated that the committees appointed by bodies such as the Purchasing Agents' Association can do no good, since they cannot add anything to the work that the Priorities Board is already accomplishing.

"We must remember," this member said, "that we are in this war and have to win it, and all our buying business should be conducted with that idea uppermost."

So that manufacturers and the War Industries Board can come to a better understanding President E. L. McGrew, purchasing agent of the Standard Underground Cable Co., Philadelphia, appointed a committee consisting of D. E. Ferguson of Pittsburgh, chairman; Thomas F. Kenney of New York, Charles A. Steele, Philadelphia; V. W. Bergenthal, St. Louis, and W. E. Hopton, Syracuse.

Some of the papers read included "Commercial Bribery," by W. P. Ogden, Scovill Mfg. Co., Waterbury; "Should the Stores Department Be Under the Purchasing Agent's Control?" by William Gugenheim, Bauer Bros. Co., Springfield, Ohio; "Buying Substitutes," by E. J. Solon, Ownens Bottle Mach. Co., Toledo, Ohio.

The program included James Schermerhorn, Detroit *Times*, a nationally-known figure, toastmaster; Edgar A. Guest, whose war poems are widely known, and Dr. M. S. Rice, a powerful patriotic speaker who made a strong appeal to every man and woman in the country to make every sacrifice and to throw themselves heart and soul into this conflict to make war head the final list of non-essentials.

In addition to the business program, the visitors were conducted to the plant of Henry Ford & Son, tractor manufacturers, at Dearborn, and the Burroughs Adding Machine Co.

How Purchasing Agents May Serve the Nation in Their Work

By C. A. Woodroof
Saxon Motor Car Co.

THE purchasing agent can best serve the nation in his work by practicing the principles of conservation, co-ordination and co-operation. It is only by the help of our fellow men that we accomplish anything. A man alone can do little of significance, but with the help of others he can build railroads and houses, and his power is practically unlimited.

It is only necessary to look at Russia, which, through its scattered efforts and lack of unity of purpose, has become nothing more or less than a gigantic jig-saw puzzle. Contrast this with England, France or the United States, where the united efforts of the people have succeeded in accomplishing a great purpose, and who on this account are going to put a glorious end to this war.

The purchasing agent is in a position to study conditions and to apply the results of his study to his work. He knows the fundamentals of a great many industries which center in his product. The purchasing agent of an automobile factory not only knows the intricacies of his own business, but he must also have a knowledge of every other line, whether it is the manufacture of a cotter pin or of photography from the clouds which cover his plant.

He must know the location of every plant making the product in which he is interested. He must know the course of making this product; he must know the equipment of the plant, and its capacity, in order to conduct his purchases with the greatest amount of intelligence.

As a result of his specialized knowledge, great numbers of the members of the Purchasing Agents' Association have been called to Washington as commissioned officers or civilians to aid the Government in the co-ordination of their war orders. Purchasing agents can help each other.

There is nothing like personal experience, but second to

F. J. Salon,
Amens-Battle Co., Toledo

Frank T. Lodge,
Detroit

E. L. McGrew,
Standard Underground Cable Co., N. Y.

this is the personal experience of others, and if we can through this association permit each other to profit by our personal experiences, one of the greatest aims of the organization will have been accomplished.

The war will impose on us a high tax for a long time. It is only by conservation and thrift that we will meet this tax. It has not been necessary hitherto for us to practice this strict economy, but it is now necessary. A lesson is pointed out to us by the French. After the Franco-Prussian war such a heavy indemnity was imposed on France that Germany thought that she would never again be able to oppose the scheme of German world dominion. It was the stocking of the French peasant which saved France.

The standardization of catalogs is a step in the right direction. The use of two colors and a standard size of sheet will conserve ink and paper. It will help the paper manufacturer, the envelope maker, and if the loose-leaf style of catalog is decided upon, it will eliminate the mailing of thousands of sheets of unnecessary matter to people who are not interested in it. It will conserve the efforts of postal clerks and of the thousands of people through whose hands the extra matter would have to pass.

The purchasing agent should only order what material he actually needs. Under no circumstances should material be hoarded. The purchasing agent should go directly to his source of supply, ordering exactly what he needs and conserving freight space on the shipment of this material. He should by no means extend his inquiries broadcast, creating a false demand and an impression of shortage where none such really exists.

The purchasing agents can suggest that automobiles be used in place of railroad trains. The truck can supplant the pinch bar and freight car for short distance moving. He can utilize the knowledge gained in his visits to other plants to suggest better and more efficient methods in his own.

He can study the economical use of materials, as, for instance, in reducing the tin content in babbitt in order to furnish a greater supply for Government needs, and, furthermore, he can use over any obsolete stock which other purchasing agents have on hand, thus helping all parties.

Above all, the purchasing agent should not compete with the Government in buying. The biggest thing a purchasing agent can do now is to aid the Government by honestly observing priorities and buying efficiently. In purchasing, it is disloyalty and treason to compete with Uncle Sam now.

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A New Book on Austin Buildings

THE "Austin Book of Buildings," No. 5, just off the press, is a 64-page volume completely covering the service performed to-day by the Austin Co. of Cleveland.

Starting with a description of the Austin method, which is an application to the construction of industrial buildings of the principles of quantity production by the development of standardized parts and models interchangeable in such a manner as to provide a large array of buildings both in type and size. The method is largely used to-day because of the fact that it provides for the erection of substantial fire-proof buildings in a minimum time.

There are chapters covering the 10 Austin standard building units, combinations of Austin standards, specifications, the Austin industrial building service, equipment and export service.

There are a large number of illustrations showing buildings that have been erected at short notice for large industrial undertakings. Detailed drawings and cross sections, floor plans, side elevations and front elevations are given.

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Teaching by Intensive Methods

IT was at first believed that a man or woman wholly unfamiliar with machine shop practice could not quickly be trained for operations of the greatest precision in non-repetitional production, but the contrary is the fact, said H. E. Miles, chairman of the Section in Industrial Training of the Council of National Defense, in a recent interview. A new person, mechanically inclined and of good intelligence, can be taught a single machine (lathe, grinder, miller, etc.) in surprisingly short time under highly specialized instruction.

At first, if the machine is complicated, it must be set up for the operator, but shortly he or she will set up the machine for any one of a series of similar operations. This has been carried to unbelievable extent in England, and in the United States women in about three weeks have been taught to run single machines within limits of one-thousandths and sometimes five ten-thousandths of an inch.

Many of the leading machine tool builders in Cincinnati, Worcester and elsewhere are developing this type of new worker satisfactorily.

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Removing Temper From Steel

THE Swiss journal, *Die Elektroindustrie*, gives particulars of a process for removing the temper from hardened steel. The piece to be softened is placed on a plate of iron at red heat and covered by a plate of cold iron. After the whole has cooled the piece of steel, whatever was its previous quality and degree of hardness, is detempered completely, and can easily be worked without its quality having undergone any change by, for example, decarburization. The method is specially applicable to the unhardening of tools, more particularly punches and dies. Tests have given excellent results, and the method has the advantage that shaped pieces of steel do not show any shrinkage after treatment.

Hawaii Has More Automobiles Than China and Japan Together

Truck and Tractor Possibilities—Used Car Problem Very Much Present—Analysis of Selling Field

THE Hawaiian Islands constitute a better export market than China and Japan, and in these islands there are to-day more automobiles than in China and Japan combined. At the end of 1917 there were 2087 cars in the islands as compared with 1678 at the end of the previous year, 1381 at the end of 1915 and 939 at the end of 1914, or 6 months after the war started.

Tom O. Jones, for years connected with the automobile industry, gives these figures in a recent report he has made to the Department of Commerce as a result of a special investigation be made for the department throughout Japan and in parts of China and in the Hawaiian Islands.

According to the report of Mr. Jones, Hawaii is not a huge market by any means, but nevertheless one worthy of serious consideration. Prosperous countries always offer attraction to the automobile maker and his sales forces, and there is no denying the prosperity of our first overseas holding. Practically every financial interest in the islands is centered in sugar, and the last few years have been ones of great prosperity for the sugar growers. It is only necessary to survey the records of the various companies since about 1913 to realize this fact.

The Securities Manual issued by the Honolulu Stock and Bond Exchange under date of May 15, 1917, shows that 12 sugar corporations, with an average capitalization of $3,187,500, paid dividends of 12.8 per cent in 1914, 23.8 per cent in 1915, and 35.2 per cent in 1916. These figures are not cited to boom Hawaiian sugar stocks, for they are the figures for only 12 companies out of 24 listed, and they make the best showing. Some of the others were less prosperous, but the figures given indicate why Hawaii is buying automobiles. Capital stock of the sugar companies is traded in rather generally and much of it is held by men in other lines of business. These sugar profits also affect many other lines of trade in the islands.

The Automobile Population

That this assists the automobile trade is conclusively proven by the following customs figures showing shipments from the United States during the years 1914 to 1917:

Years	Number	Total value	Average value
1914	939	$961,677	$1,024
1915	1,381	1,482,622	1,074
1916	1,678	1,672,190	997
1917	2,087	1,941,820	935

It is evident, therefore, that Hawaii is taking a larger number of cars each year, and that the average price of these cars is being reduced each season, an intimation to the makers of the lower-priced cars that the field has attractions for them.

Hawaii has felt shipping conditions as keenly as territories much farther away, and it is literally true that for the past year and a half the selling of motor cars has been more a question of getting deliveries than of finding buyers. This condition is proved by the fact that one company which received a shipment of 30 cars, having a list price in the United States of over $1,500 each, disposed of the entire shipment within 10 days after arrival last fall, and difficulties have, of course, considerably increased since then.

Motor vehicles are used to a large extent on four of the islands. Oahu has approximately 3400 cars at the present time, Hawaii 1500, Maui 800 and Kauai 580. There are probably over 30 motor vehicles on the other islands.

Selling Methods

Doing business with Hawaiian dealers is so nearly identical in every detail with business with any distributer in America that it needs very little comment. The manufacturer doing business with any of the established companies on the islands would be safe in drawing his drafts just as he does on a rail shipment to any distributer in the United States. However, most companies treat the shipments as export business and require payment against steamer bill of lading at point of shipment, although some manufacturers handle the territory as subsidiary to the San Francisco branch or distributer. It is fully worth a direct factory contract.

Honolulu is, of course, the commercial center, and headquarters for distribution must be established there. Some of the larger dealers have branches at Hilo to handle the business on the island of Hawaii. To secure the trade on the other islands, either a resident agent is appointed, who stays in the territory at all times, or a salesman from the Honolulu establishment makes regular trips for the purpose of closing retail sales. One car manufacturer has an independent contract with a Hilo dealer, as well as one at Honolulu, but in most cases the business can be handled as satisfactorily by turning over the whole territory to a Honolulu dealer.

Used Cars on Hand

Possibly 50 per cent of all sales made on the islands are contingent on the taking of a used car. As a consequence, the disposal of secondhand cars has become a matter of serious worry to the dealers. Within the last year several such cars have been exported to Japan. The dealers claim that they are endeavoring to foster this business by taking precautions to see that the cars are in good condition when shipped.

The higher-priced cars are sold almost altogether on a cash basis. An exception to this rule is found among Hawaiian and Japanese who are driving their own cars in rent service. The machines bought for this purpose are generally big seven-passenger cars which in the United States sell for $2,000 up. These drivers prefer

to buy new cars, paying for them on a monthly basis and giving the old car as the first payment. Some of the secondhand cars in good condition find an outlet in this field.

Buying of the lower-priced cars, that is, cars listed at less than $1,000 in America, is done largely on a payment basis, usually one-half cash and the balance within one year. This condition is one that requires a considerable amount of capital in the operation of the business. Instances can be cited where men, impressed with the possibilities of trade in Hawaii, have invested the greater part of their capital in buying and bringing in sample cars, only to find upon studying conditions that a far greater amount of money would be required to establish the business.

There are many inducements to impel and almost demand the ownership of a car in Hawaii. Distances are not short. Honolulu itself has good street car service, but there are many points that can not be reached conveniently by trams, and the motor is preferable in going to the beaches, various army posts, and the country club. On the other islands practically all transportation is done by private vehicles. The distances between plantations and the sugar mills are considerable, and, of course, the motor car cuts down time. Nearly everyone looks forward to the ownership of a car at as early a date as possible.

Road conditions generally may be classed as very fair. Residents complained bitterly over the conditions of some of the highways, but on the whole they are not bad. A considerable amount of road work is being done in all the islands.

Trucks Are Gaining

The value of the commercial motor vehicle is fully realized by the business men in the territory. In the cities of Honolulu and Hilo these vehicles are superseding other means of hauling, just as they are in cities on the mainland and in practically the same proportion. Numbers of trucks are used by the army transport service.

In the outlying districts the sugar companies have found trucks suitable for at least two purposes up to the present time, namely, the hauling of laborers to and from their work and the carrying of supplies. Some of the plantations cover large areas. The employees, of course, are scattered, and when work is to be done at a distant point, trucks are usually assigned to pick up the workers each morning at some given assembling place and carry them to the fields. The plan has been found to pay well, for the workers reach the fields in better condition for work than if they had been forced to walk several miles. They get to work earlier and also work later, the truck calling at the end of the day to take them back to their homes.

Tractor Field Is Slow

More difficulties beset the tractor, and its introduction in the islands will be considerably slower than in the case of trucks. This, the planters claim, is due to the fact that sugar land must be plowed to a depth of 18 to 22 inches. The method now generally employed in plowing is to place two large Fowler tractors on either side of the field, attaching the plow to a cable connecting the tractors and draw the plow from one side of the field to the other. The cable is wound on drums on the tractors. In this way the desired furrow depth can be attained, and no other method as satisfactory or economical has yet been devised. There is a possibility of the use of the smaller tractors in harrowing. For the transportation of the sugar cane after it is cut the railroad system is employed. Some plantations have as much as 80 miles of track laid through their grounds. These narrow-gage tracks take but a minimum of space and offer the best means of bringing the cane to the mills.

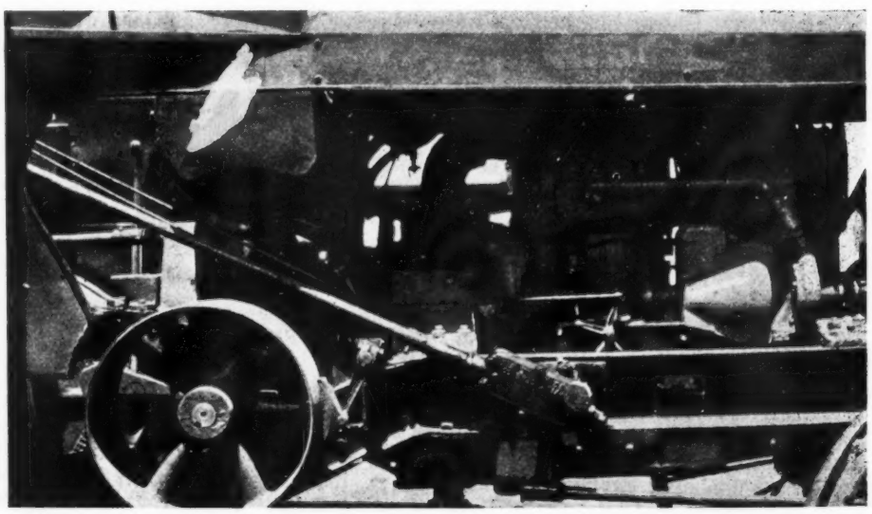
Agricultural Possibilities

Some of the American tractors are suitable for the cultivation of pineapple land, and there is a field here for their use, as the plowing is not so deep as that required on cane land. Much of the pineapple land is hilly and the tractor must be well motored to do the work. A small caterpillar tractor was brought into the islands within the past year, but too recently to make possible any conjecture as to its ultimate success.

The market for accessories, tires, and other requirements is identical with that in the United States for an equal number of cars. The dealers now established have very attractive showrooms and good garage facilities and are fully worthy of the best attention of the manufacturer.

Increasing Tractor Accessibility

HERE is a steering gear placed where it can be reached easily and conveniently for adjustment or repair. While it is not practicable to place the steering gear outside the frame of a passenger car or truck there seems to be no reason why, in most cases, it can not be done in tractor building. It's a point worthy of the careful consideration of all tractor designers.



Relative Efficiency of Male and Female Operatives

A Comparison of the Output of Women and Men on Similar Work—A Study of the Experiences of 127 Manufacturing Establishments in the Metal Trades

WHAT is undoubtedly one of the most comprehensive and exhaustive investigations into the present extent and the possible extension of the employment of women in industries in the United States, and one of the most thorough and informative presentations of results obtained from such research effort, is covered by and embodied in the report of the National Industrial Conference Board on the wartime employment of women in the metal trades.

As was mentioned in a recent issue of AUTOMOTIVE INDUSTRIES, the association of manufacturers' associations, because of the importance of the metal trade to the conduct of the war, and the widespread desire of manufacturers to obtain all available information concerning the employment of women as operatives in metal working plants, began, early this summer, an investigation on an elaborate scale to determine the extent to which women have so far been substituted for men, or introduced as additional workers into the industry, their relative efficiency, wages, working conditions and other factors such as attendance, labor turnover and the necessary and desirable changes in plant and equipment which have been indicated by experience.

Some 600 selected establishments were furnished with a questionnaire, and the results obtained from this source were supplemented by field inquiry and observation. Approximately 330 establishments replied to the questionnaire, but of these only 131 employed female labor in manufacturing processes. In these 131 establishments there was a total working force of 384,709, of whom 49,831 were women and 334,878 were men. Women, therefore, represented 12.9 per cent of the total.

While a number of the employers who responded to the questionnaire indicated in their replies that they contemplate a reorganization of their plants in order to fit them better to utilize the increased number of women whom they expect to employ in the near future, it did not appear from the data obtained that there has been so far any great increase in the number of women used in the manufacturing industries, except in a relatively small number of companies, and more especially in those which are engaged in the manufacture of war materials.

It is not possible, says the report, a part of which is reproduced verbatim in the following paragraphs, to determine what percentage of the total number of women employees in the 131 establishments has been added or substituted on work performed by men previous to August, 1914. From 96 establishments which furnished definite figures on this point the women added or substituted during the period since that date numbered 10,801 out of a total of 34,667 female employees, or 31.2 per cent; 5100, or nearly 50 per cent, have been added or substituted in ten munition establishments.

Table No. 1 as given here is compiled from replies received from 10 concerns in the automobile and automobile accessories field. These concerns employed a total of 78,400 men and 3690 women. Of the women, 1673 had been added or substituted on men's work since August, 1914.

Table No. 2 classified the establishments from whom answers to the questionnaires were received, according to the relative efficiency of men and women workers as measured by output on the same respective processes.

Eliminating the 28 establishments in which, for one reason or another, no comparison can be made, this summary indicates that the output of women compares favorably with that of men, since it appears that in 30 establishments of the remaining 99 the output of women was greater than that of men in all operations on which both were engaged; in 6 it was greater in some, equal in others; in 30 it was equal to that of the men. In other words, in 66 establishments, or two-thirds of those furnishing definite information as to output, women's production was equal to or greater than that of men in the operations on which both were employed. In only 15 establishments was it found that women produced less than men in all operations on which they were engaged. Their production in the remaining 18 establishments, although less on some operations, was equal or greater on others.

Relative Efficiency of Men and Women

It appears, moreover, that the efficiency of women did not depend on the nature of the industry as such, or to any marked extent on the fact that they had but recently been introduced into an industry. In none of these classifications do a majority of establishments report women always less efficient than men, and it is significant that in the manufacture of foundry and machine shop products, on which women were in the past seldom employed except as coremakers, 24 establishments report women's work equal or superior to that of men in all operations, as against 5 finding them inferior.

TABLE NO. 2—SUMMARY COMPARISON OF OUTPUT OF WOMEN WITH THAT OF MEN ON SIMILAR WORK BY INDUSTRIES

(National Industrial Conference Board)

Classification of Establishments	Total number of establishments	Output of Women: Greater in all operations	Greater in some operations, equal in some	Equal in all operations	Greater in some operations, less in some	Equal in some operations, less in some	Less in all operations	Not comparable or not stated
Total	127	30	6	30	7	11	15	28
Automobiles and automobile accessories	10	1	..	3	1	2	1	2
Typewriters and other light machines	6	2	..	2	..	1	..	1
Electrical machinery, apparatus and supplies	18	2	..	6	2	2	2	4
Foundry and machine shop products	37	12	1	11	1	2	5	5
Munitions	13	4	..	1	2	1	2	3
Railway equipment	7	1	1	1	..	3	1	..
Tools, cutlery, and hardware	16	5	2	4	..	..	..	5
Miscellaneous metal products	20	3	2	2	1	..	4	8

Analysis discloses that among those operations which some employers reported women to be performing less efficiently than men, there are very few which are not being carried on with much success by women in other establishments. For instance, in one automobile factory women are found inferior to men in light bench and machine work; yet in a similar factory and in many others doing similar work their output

Table No. 1—Relative Efficiency of Male and Female Workers

A Comparison of the Wages and Output of Women and Men in Ten Plants in the Automobile Industry

Prepared from Data Gathered by the National Industrial Conference

Serial Number and Product of Establishment, and Number of Men and Women Employed (a)	Number of Women Added or Substituted on Men's Work Since August, 1914 (b)	Occupations of Women (c)		Wage Rates of Women Compared with Rates of Men so far as Reported	Abstract of Employer's Statement as to Wages	Abstract of Employer's Statement as to Output
No. 1 Automobiles 12,021 men 815 women	390	Drill press Gear machine Lathe Milling machine Punch press *Coremaking*	*Sewing machine* BENCH WORK Inspecting Stock room attendant Tool room attendant		Women do not receive same rate of pay, because it is necessary to provide extra help for handling stock and setting up machines; average earnings for female help as compared with male are about 60% to 65%.	Women as efficient as men on drill presses, light bench-work, and light inspection; on punch presses approximately equal, but necessary to provide die setters, start machines and place stock so that women do not do lifting. In light stock handling about as efficient; on medium heavy bench work 75% to 80% as efficient.
No. 2 Automobiles 9,034 men 461 women	277	Drill press, light Lapping machine Shaving machine Milling machine Bench work Stock room attendant	*Electric wiring* *Cutting and sewing leather for bodies* Inspecting, light ASSEMBLING, LIGHT	Time, less	Women receive two-thirds men's day rate on same job, but same premium. Piece rates not stated.	On machine work, not as efficient as men, because women lack mechanical knowledge; on stock handling, inspection, etc., sometimes better than men, more thorough and careful.
No. 3 Automobiles 32,954 men 371 women	100	*Machines, light* *Bench work, light* Putting covers on coil units and testing	Soldering Adjusting *Assembling*	Time, equal	No women on piecework.	Women do 10% less than men; though faster, they have less endurance.
No. 4 Automobiles 836 men 105 women	Not stated	Machines Bench work Inspecting	Disassembling chassis		Wages of women same as those of men, considering character of work.	Output of women same as that of men.
No. 5 Automobiles 5,629 men 315 women	72	Sewing machine Coremaking			We aim to pay practically same for output as when men were on the job. On sewing machines men made about 45c per hour; women earn about 35c.	Women on sewing machines do slightly less than men; on light coremaking, as much as men did formerly.
No. 6 Automobiles 875 men 89 women	11	*Sewing machine* *Pasting* Back stuffer Inspecting			Women receive less pay than men.	
No. 7 Automobile accessories 1,250 men 450 women	300	Drill press Lathe, hand screw Lathe Milling machine Slot machine	Machines, practically all light Inspecting, light *Armature winding* *Assembling, light*	Piece, equal	Time rates not stated.	Equal.
No. 8 Automobile signals 285 men 100 women	100	Drill press, light Foot press, light Power press, light Assembling		Piece, equal	No women on time work.	Equal.
No. 9 Automobile bodies and aeroplane bodies 6,350 men 150 women	Not stated	Sewing machine aeroplane upholstery	*Sewing machine, automobile upholstery*			Too early to judge.
No. 10 Automobiles 9,166 men 834 women	423	(*By Departments*) Drill Gear Mill Press Auto B & S Threading Inspection Tool room Tool repair Tool store	Indirect material Fitting Motor Transmission Trimming Store Carpenter Receiving Stock Repair Shipping	Piece, equal	Almost all women engaged in machine work are paid piece rates, their rates being invariably same as men's. Women assemblers and miscellaneous employees are paid by the hour, commencing at 25c and raised according to ability. Time rates not stated.	Women's output almost invariably greater, in some cases disproportionately greater, than men's.

Explanatory Notes:

a—The figures in this column include clerical employees, in the majority of establishments.

b—The figures in this column include clerical employees in a few cases, but their number is practically negligible.

c—*Italics* in this column indicate occupations on which women were employed previous to August, 1914; SMALL CAPITALS indicate occupations on which women were employed previous to August, 1914, and on which their employment has been subsequently extended; Roman type indicates occupations on which women have been newly introduced since August, 1914. Clerical occupations are not designated.

on the same processes is equal to or greater than that of the men.

An aeroplane manufacturer reports that women produce only half as much as men in assembling work or in welding, or in operating drills, punch presses, and hand millers; yet in other factories women have been found to excel men in all these operations except welding, and in welding at least one establishment has found them equal to men. Sorting and packing, reported as being done less rapidly by women in one machine tool establishment, are occupations in which they had already achieved marked success elsewhere.

The success reported in these cases suggests that extended experience, improvements in management, or other changes, might insure to those plants where the output of women falls below that of men the same good results that are now secured by others in their lines.

Among operations which are nowhere reported to be performed as well by women as by men are chipping castings, machine filing, lapping gages, and brazing. The first two are somewhat heavy work for women. Women were doing machine filing in only two and brazing and chipping castings in only one of the establishments reporting.

Experience of Individual Establishments

Further light is thrown on the question by the statements of employers as to the operations successfully performed by women. In one automobile establishment women are working on shaving machines, milling machines, light drill presses, and lapping machines, and are doing bench work, light assembling, stock handling and inspection of small parts. In regard to their output it was stated:

> On productive work, women as a rule are not as efficient as men, due to the fact that they have no mechanical knowledge of machines and do only what the job setters show them; also, on assembly work they take longer to understand the proper fits, etc., than a man. On nonproductive work such as stock handling, inspection, etc., the women are as good as the men, in some cases much better, as they are more thorough and careful. This is particularly true of the light work.

In another automobile plant, where women are employed in 23 departments doing the same types of work enumerated above and performing other tasks formerly carried on by men, they give still greater satisfaction:

> The comparative output of women on the same process is almost invariably greater than that of the men, in some cases quite disproportionately so. In some cases, notably on a nut tapping machine, a woman was put on and at the end of the week she had turned out about double the quantity of the man working next to her, and after endeavoring to equal her speed for a few days, the man quit, and was replaced by another woman who is now very nearly the equal of the first. We find, particularly in assembly work, that the women are much more conscientious and painstaking than the men.

The report of a gear manufacturing establishment where women are sand blasting very small castings and performing grinding, drilling and broaching operations indicated that their output is from 15 per cent to 25 per cent higher than that of the men.

An unusually striking instance of the efficiency of women in metal trades work appears in a recently published statement of a New York gear manufacturing concern:

> On our three-inch Gleason generators, the largest day's production turned out by our best men operators on differential side gears was 91 pieces, and on differential pinions, 260 pieces for a nine-hour day. The slowest woman operator in point of production equals the best day's product by the men, and our speed merchants, as we call them, turn out 126 side gears and 320 differential pinions in a nine-hour day, an increase of 35 side gears and 60 differential pinions.
>
> On our 24-inch Fellows gear shapers the women turn out from 20 to 30 more pieces in a nine-hour day than the men.
>
> On our filing and burring machines, the women are far ahead of the men on production and accuracy. They overrun the men about 250 pieces in nine hours, and the small amount of work rejected by the inspectors is surprising, as compared to the amount that the inspecting department rejected when the same machines were operated by men.
>
> On our drill press work is where our women really shine. In one case they have increased the production 1200 pieces in a nine-hour day. The case I speak of is putting on a radius and reaming the bore of differential pinions. This requires two operations on a two-spindle drill press, one operator putting in the radius and the other reaming the bore. The largest production turned out by two men was 3200 pieces each; to date, two women have turned out 4400 pieces each in nine hours, under exactly the same conditions, and it is hard to tell where they are going to stop. We have one woman who drills two 5/32 in. oil holes ¼ in. deep and one ⅛ in. hole ⅜ in. deep in 246 stem gears in nine hours; this is 50 more pieces than the men ever turned out.

One of the most conspicuous examples of success with women workers is offered by an establishment employing 5000 women in practically all mechanical operations required in the manufacture of fuses. On the basis of time studies, a maximum of 375 standard pieces per day had been set for male turret lathe operators, who were turning out an average of 190 pieces; when women were employed on this work they produced 531 pieces. In the assembly department, where 2000 girls are at work, the estimate by two sets of engineers for the best possible production by men was 15,000 complete fuses daily in two shifts; the average output actually obtained when women were employed was 38,000 per day in one shift. In this case, however, the excess of output actually obtained over the estimates was so great as to leave little doubt that some other factor than the superior efficiency of women was involved. The president of this company considers the endurance of women, as well as their rapidity, superior to that of men:

> In spite of the amount of work they do, they are not overworked. In fact, they seem to be able to keep up their high rate of speed better than the men. In one of the assembly departments, for instance, we tried men on a particularly trying job. At the end of three days they came to us and told us that the work was too strenuous. We put girls on the benches, and since then there has been no complaint.

In a steel establishment where women are employed in manufacture of fuses, women operators of drill presses and milling machines are found to be from 25 per cent to 50 per cent faster than men. Another manufacturer of small metal parts for munitions stated that women drill press operators handle 196 parts per hour on daywork while on nightwork men turn out only 148. Although the output on a day shift cannot fairly be compared with that on a night shift, this would not explain so marked a difference in results. In a bolt and nut establishment women working on drill presses and milling machines have achieved an average increase in output amounting to 30 per cent.

An especially interesting illustration of the variety of work of women in railroad shops is given by a woman who has risen from mechanical work to an important executive position. In one of these shops women were employed as follows:

1 milling machine operator	6 car preparers
2 coremakers	4 upholsterer helpers
1 chipper	2 carpenter helpers
1 tinsmith helper	1 locksmith
1 rivet heater	2 lacquerers
1 ordinary drill operator	1 turntable operator
1 tool dressing helper	4 yard laborers
4 hammer drivers	

In another, women were, in addition to these occupations, operating cranes, lathes and boltheaders, and grinding drills. With regard to their efficiency it was stated:

> The comparative output of men and women on the same processes varies with the type of work. Usually the output is similar. One foreman said: "In quantity less; in quality women put out superior work."

Some incidental advantages mentioned by various manufacturers are pertinent in considering the introduction of women workers. Women are commended as being more thorough and conscientious than men, as spoiling less work and as being more careful of tools. Even where the quantity of their work is less than that of male workers, the quality is frequently reported as better. Another valuable characteristic sometimes referred to is the regularity of women's output. A bolt and nail manufacturer employing women on pointing bolts, thread cutting, nut tapping, filing, papering and packing bolts, reported their output as at least 10 per cent larger, and added that the quantity can be depended on from day to day.

Absence of Restriction of Output

The reported superiority of women in some of the instances cited was so great as to suggest that restriction of output by men may have played a part in raising the comparative efficiency record of women. Certainly there is a strong probability that where phenomenal increases of output were obtained by women workers the men had not been working up to their capacity. The information obtained on this point was not sufficient to warrant conclusions. Evidence from other sources, however, suggests rather definitely that women are less inclined than men to practice arbitrary restriction. A statement made by the president of the British Iron and Steel Institute is pertinent:

When it was found that the demands of the government for a greatly accelerated production of shells required the employment of girls in the projectile factory, owing to the scarcity of skilled workers, these girls in all cases produced more than double that by thoroughly trained mechanics—members of trade unions—working the same machines under the same conditions.

In the turning of the shell body the actual output by girls with the same machines and working under exactly the same conditions and for an equal number of hours, was quite double that by trained mechanics. In the boring of shells the output was also quite double, and in the curving, waving, and finishing of shell cases quite 120 per cent more than that of experienced mechanics.

Restriction of output by male workers in Great Britain before the war was admittedly very common; a large proportion of the increased production in that country is to be attributed to the absence of restrictive practices among women workers.

Yet in many types of light work women apparently are capable of bettering men's record even when the men do their best.

Present Limitations of Women's Efficiency

In reviewing this record of efficient performance by women it must be emphasized that most of the tasks on which they are engaged are semi-skilled work of repetitive character, in which rapidity, lightness of touch, and natural dexterity are more important than skill acquired through long training and experience.

The reports of employers often refer to the special deftness of women in handling small repetitive work, and in numerous plants departments have been arranged to secure a better routing of material and a subdivision of tasks which offer a maximum of light repetitive operations. This is doubtless the most direct road to the immediate successful utilization of female labor.

It is too early to form conclusions as to the ability of women to perform work of higher skill. The necessity for immediate increase of output made it essential to give women specialized training for particular jobs rather than to develop them into general mechanics. Even in England, where in one place or another women are used in practically all operations in the engineering and munition trades, they have not received the broad general training which skilled workmen are given. Opinions of English employers have undergone considerable change during the course of the war. Although the subdivision of the processes has secured most remarkable results, women collectively are doing much more than mere repetition work. According to one British report:

Women have entirely destroyed our pre-war ideas as to what constitutes "skilled" work. When in the early days of the war women were trained to turn out 19 pdr. H. E. shell and equal the production of male labor, many thought that such work, amounting as it does to a little more than manipulative dexterity, was about the limit of the capacity of women who had not received a regular course of engineering training. After a few months workshop experience, however, women are to-day building the greater part of one of the best high-speed engines in the country, each woman setting her own tools and work, and able to machine any piece of work that the tool she is on will take.

Women are doing magnificent work both in regard to accuracy and output.

It should be emphasized, however, that even where women are doing such work as setting up, assembling, or performing machine tool operations, they have been trained for a particular type of machine and for a limited range of operations. How far the present limitations of women workers, noted by both American and British manufacturers, might be overcome by broad technical training cannot be determined from experience now available.

Wages

The following summary indicates the wage policy of establishments furnishing data for this investigation as reported in replies to the schedule of inquiry.

In this table the column headed women's rates "Equal to men's" means that rates were the same for men and women whether on piece or day work respectively; in some cases women were engaged exclusively on piecework; in other cases on time work. The establishments listed in the column headed "Less than men's" also sometimes employed women exclusively on either piece or time work. In a few cases, as stated in the footnote, complete information was not furnished. Again, the operations were sometimes modified so that the work done by women, while similar to that done by men, was not identical; for instance, additional help was provided or only the lighter part of the operation performed by women. In such cases piece rates paid women frequently were lower than those paid men; in some other cases women were paid lower time rates.

TABLE NO. 3: SUMMARY COMPARISON OF WAGE RATES OF WOMEN WITH THOSE OF MEN, BY INDUSTRIES

(National Industrial Conference Board)

Classification of Establishments	Total Number of Establishments	Wage Rates of Women			
		Equal to Men's	Piece Rate Equal to Men's, Time Rate Less	Less than Men's	Not Comparable or Not Stated
Total	127	53	29	24	21
Automobiles and automobile accessories	10	4*	1	3†	2
Typewriters and other light machines	6	2	2	2	
Electrical machinery, apparatus, and supplies	18	3	2	8†‖	5
Foundry and machine shop products	37	18*¶	8	7	4
Munitions	13	5	6	..	2
Railway equipment	7	6	..	..	1
Tools, cutlery, and hardware	16	9	3	1	3
Miscellaneous metal products	20	6	7	3	4

*In two cases time rates not stated.
†In one case piece rates not stated.
‡In one case time rates not stated.
‖In some cases piece rates equal.
¶In one establishment some piece and time rates are less.

Excluding the 21 establishments for which there was no basis for comparison, this table shows that in 53 of the remaining 106 women received the same rates of pay as men, whether on time or on piece work; in 29 women's piece rates were the same as men's but their time rates were lower; in 24 both piece and time rates were lower. It may be noted in this connection that the U. S. Department of Labor has declared itself in favor of equal wages for women performing the same work as men on Government contracts, and that a similar position has been taken by the Director-General of Railways in ordering the recent wage increases and by the National War Labor Board, which has defined its policy in the following terms:

If it shall become necessary to employ women on work ordinarily performed by men, they must be allowed equal pay for equal work.

Equal Wages for Equal Work

The principle of equal wages for equal work found especially marked recognition among employers in those industries where the employment of women is a comparatively new feature. For example, 18 establishments manufacturing foundry and machine shop products pay women equal rates in all cases where they are performing the same work as men, while 8 pay them equal piece rates. In the munitions industry, 5 establishments pay equal rates and 6 others pay equal piece rates but lower time rates. The relatively large number of cases where women receive lower rates in electrical manufacturing probably is due to the fact that women have been employed in this industry for a much longer period and that certain occupations came to be regarded as women's work when the principle of equal wages was seldom accepted.

Where the wages of women were less than those of men, the difference usually was from 10 per cent to 25 per cent, although in seven establishments there was a still greater difference. Various reasons were assigned for this lower wage scale. One machine tool manufacturer declared that it was the intention to pay equal wages as soon as the cost of changes made to allow the introduction of women has been recovered. Some stated that women's wages are gradually being increased as they become more efficient, with the intention of ultimately making them equal to those of men. In several places women are paid a lower time rate while learning, after which they receive equal pay on a piece-rate basis.

Another reason offered for lower wages to women is the necessity of providing them with helpers to set up machines, to make repairs, and to bring up stock, or of introducing specially adapted tools.

The preceding discussion refers to rates of wages and not to earnings, which may differ although rates are equal, either on account of the individual capacities of the workers, their endurance, the hours of work, or for other reasons.

Making War Maps by Camera

Airplane Needs Skillful Piloting While Photographer Works—Color-Sensitive Plates Used in Non-Focusing Box-Type Apparatus

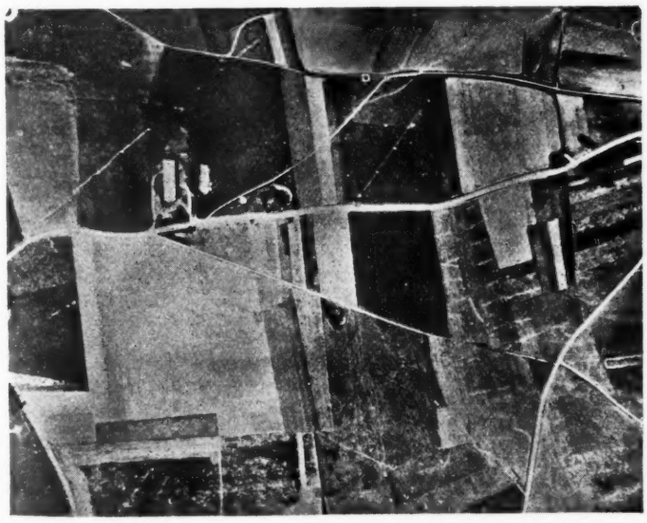
PART II

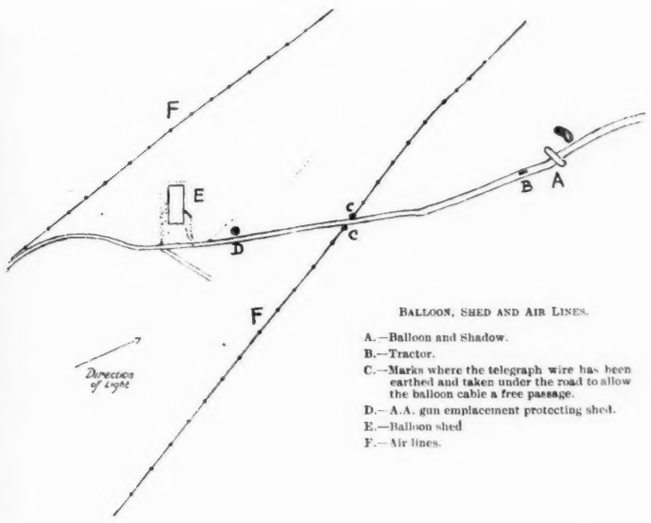
AERIAL photography is not in itself a particularly safe occupation. Leaving an aerodrome, equipped with a camera and supply of plates, the machine climbs toward the enemy line, and almost instantly encounters the archies, the anti-aircraft guns, which are always on the lookout for reconnaissance machines. As a rule, these encounters are a sort of continual match between the pilot's ingenuity and the anti-aircraft gunner's power of prediction. The gunners must guess where the pilot is going in order to allow the time necessary for his shells to reach the machine. The pilot usually takes a side slip, but when he is taking overlapping photographs this is impossible, and he evades the gun by manipulating his throttle, slowing down if the gunner is firing much ahead of him, or speeds up if the shells are behind him. Following a photographic reconnaissance the negatives are turned over to the photographic section immediately upon arrival at the hangar, and are developed and printed almost as quickly as the plane is pushed into the shed.

Automatic No-Focus Cameras Used

During the first months of the war, ordinary cameras were used, but the leather bellows were found disadvantageous, because they were blown in by the great wind pressure. Focusing cameras were found inefficient. Changes resulted in automatic cameras, with the focus at infinity, requiring no focus adjustment, and constructed in a box type without the leather bellows. Plates are changed automatically as quickly as the photograph is taken, either by the use of small propellers, electricity, or clock mechanism. This gives the pilot less detail work and allows him to take his photographs while at the

Stores of batteries. A shows the typical German stationary anti-aircraft gun pits with concrete pedestals in the center for gun mounting. B shows the ammunition pits and the dugouts connected by short lengths of trench. C shows the dugout from the trench for the personnel





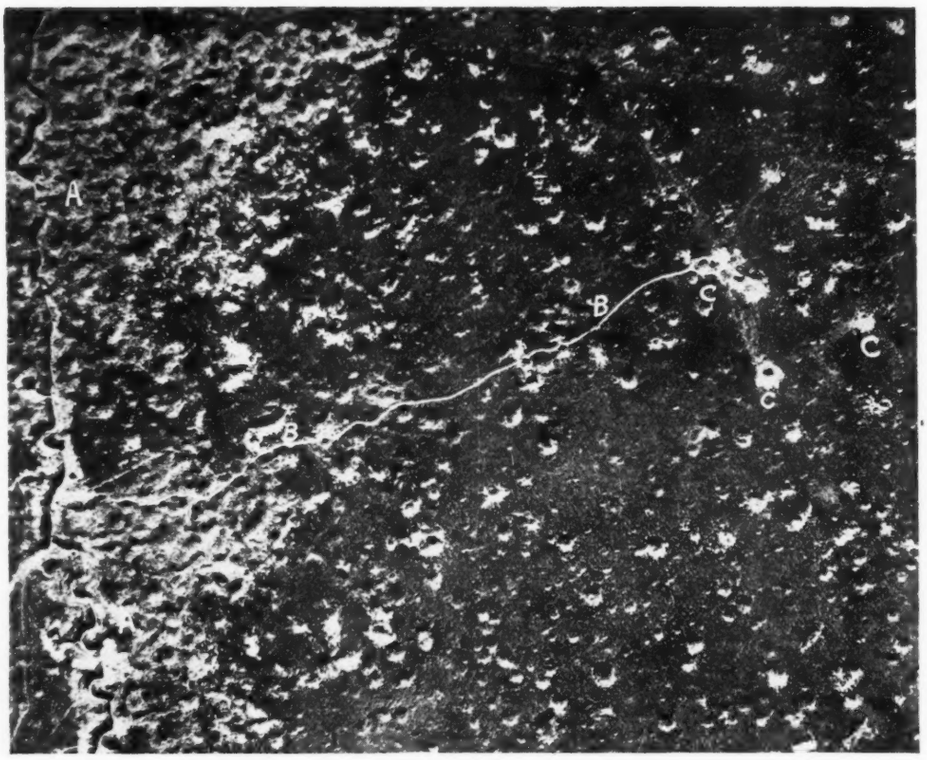
BALLOON, SHED AND AIR LINES.

A.—Balloon and Shadow.
B.—Tractor.
C.—Marks where the telegraph wire has been earthed and taken under the road to allow the balloon cable a free passage.
D.—A.A. gun emplacement protecting shed.
E.—Balloon shed
F.—Air lines.

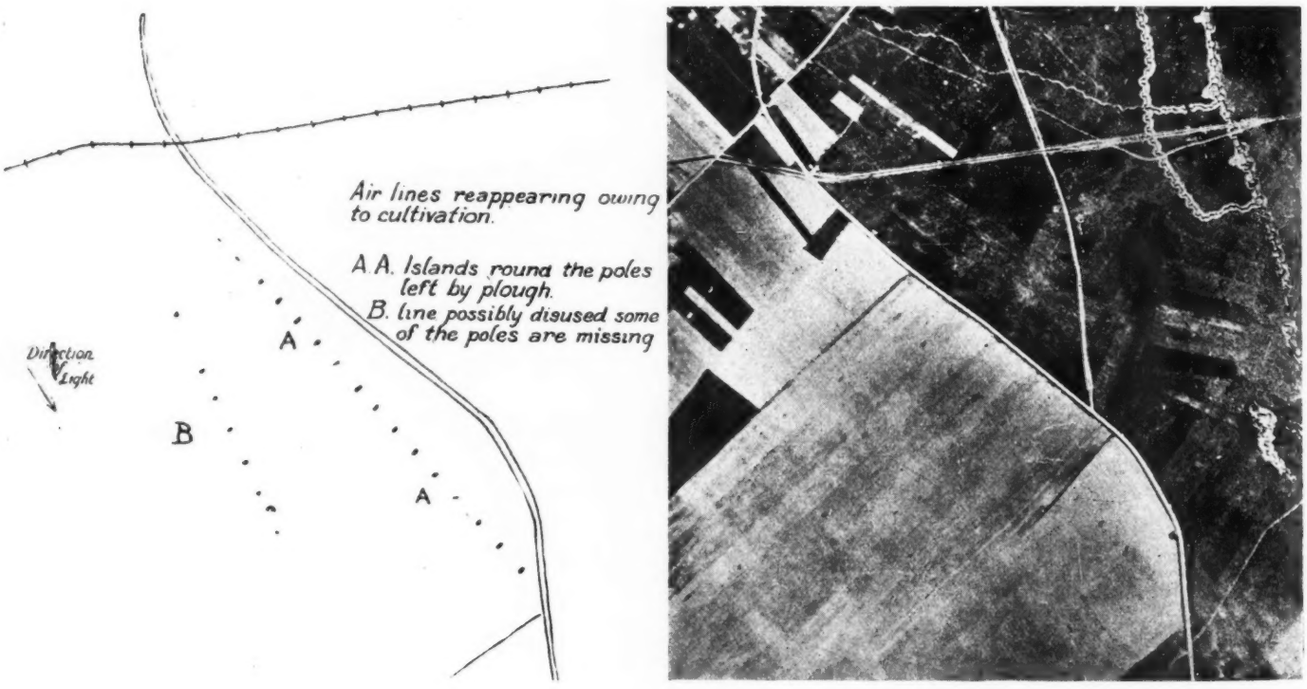
A very interesting photograph, showing a balloon, tractor, balloon shed, gun emplacements and an air line. The balloon is reflected in the photograph by a small white sausage-shape and is made readily discernible by its shadow on the ground, which proves that it is an object suspended in the air. The tractor B, although discernible in the original photograph, is not clear in the reproduction

same time watching for enemy aircraft. An important need in aerial photography to-day is a satisfactory automatic film camera which will eliminate the need for glass plates and allow greater numbers of photographs to be taken. At first, the fastest types of plates were used, but owing to the flat results obtained and to the invariable ground mists in Europe, color-sensitive plates, such as panchromatic plates with yellow filters, were used more advantageously. Small 4 x 5 plates were used at first, and enlarged, but the use of larger plates is now approved.

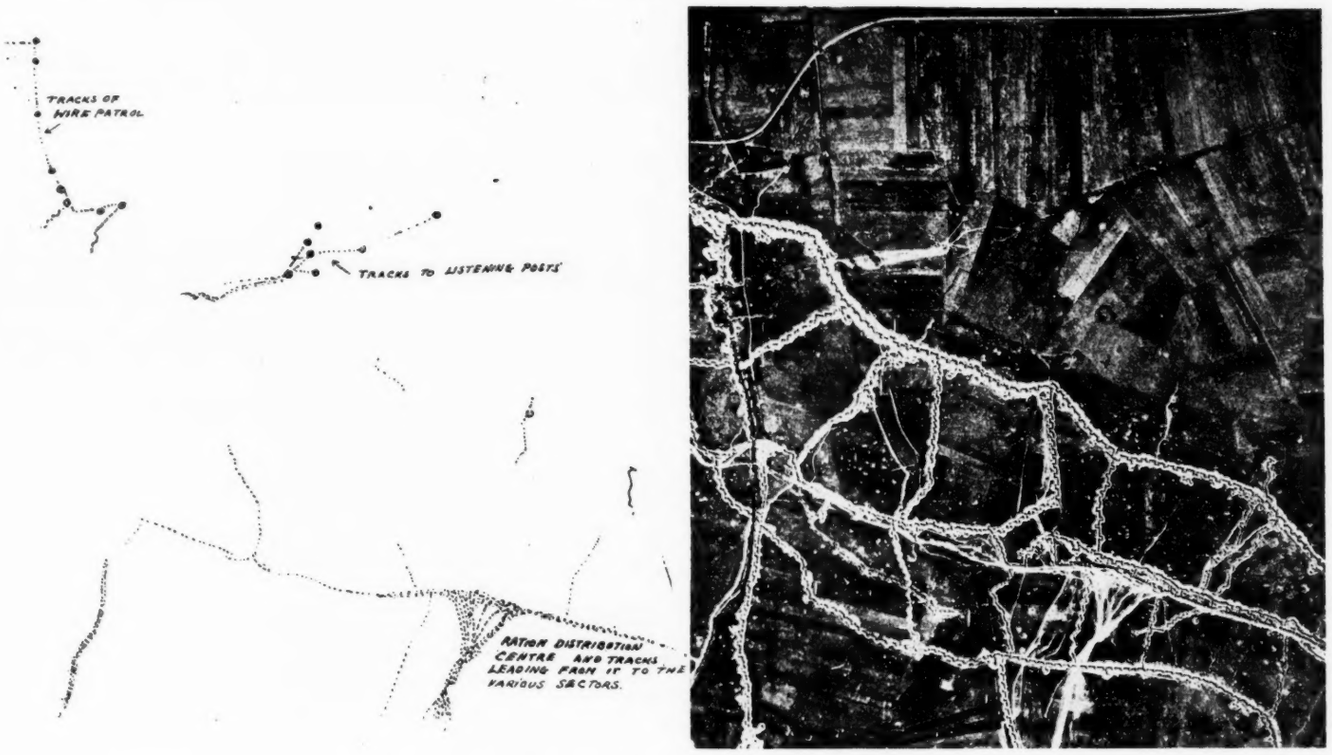
The photographs accompanying this article and the maps made from them are taken from an instruction book for the Intelligence Division of the British Army. This book is the first of its kind and some idea of the tremendous importance of this branch of the army is reflected in the character of the illustrations and the interpretative diagrams. During the recent Allied offensive it was not uncommon to have a print before an officer planning an attack less than 45 minutes after the plate had been exposed.



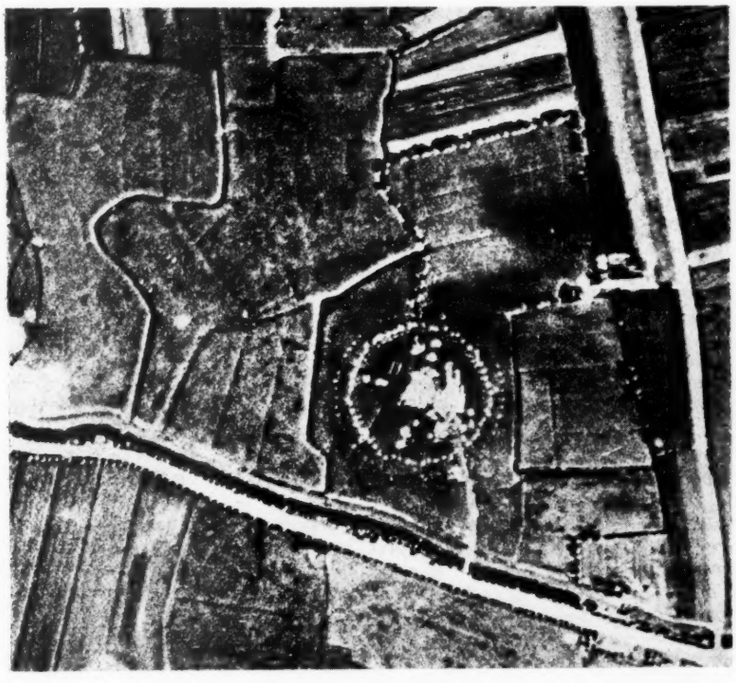
Fortified shell holes in No Man's Land. The letter A shows the German front line trenches. B indicates the track between the front line trench and the fortified shell holes in No Man's Land. C marks the net of organized shell holes. Using a photograph of this sort an artillery commander directs his artillery

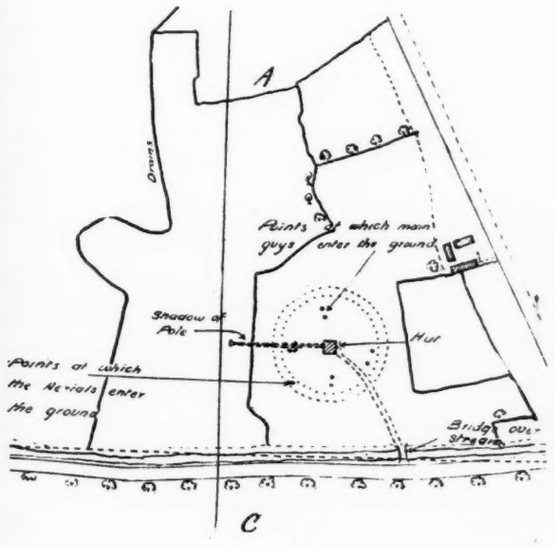

Air lines reappearing owing to cultivation.
A A. Islands round the poles left by plough.
B. line possibly disused some of the poles are missing
Direction of Light
A
B
A

This interesting photograph and sketch map of buried cables and air lines show clearly how the intuition of a Sherlock Holmes is essential in interpreting aerial photographs. In the diagram the letter A indicates small dots which show as black spots in the illustration. The interpreters of the photograph decided that these black spots represented parts of a farm which the farmer did not plow. They figured that he did not plow them because there were obstructions, such as poles. Because the poles were regular in their formation they decided that it was a telegraph or telephone air line of communication


TRACKS OF WIRE PATROL
TRACKS TO LISTENING POSTS
RATION DISTRIBUTION CENTRE AND TRACKS LEADING FROM IT TO THE VARIOUS SECTORS.

Network of trenches showing the listening and observation posts. It is by the use of photographs like this that the infantry commanders make their night raids over the top for prisoners. The photograph shows the exact location of the enemy. The raiding party knows accurately how to surround the posts without suspicion





Interpretation of Air Photograph, Showing German Field Wireless Station Near Lepelhem

1. *Air Photograph No.* 48 *N*62, *dated* 17*th July, and taken at* 8 *a. m., shows a German field wireless station. The reasons for arriving at this conclusion from the examination of the photograph are as follows:*

(*a*) *The shadows cast by a pole protruding from, or in the vicinity of, a hut.*

(*b*) *Double heaps of soil at regular intervals of* 90 *deg., suggesting the pits made in chalky ground for anchoring the guy ropes supporting the pole.*

(*c*) *A double circumference of pits, enclosing the station, which is of the "Umbrella" type, i.e., composed of a series of wires forming a cone.*

(*d*) *Bridge and track used by only a small personnel, as shown; also by the undisturbed grass, except in the immediate vicinity of the hut.*

2. *The height of the pole has been calculated at* 120 *feet to* 125 *feet. The height of the sun at* 8 *a. m. on the* 17*th of July was* 24 *deg. The necessary corrections have been made for summer, local time, etc.*

Greater Engine Efficiency Demanded

War Economics Require We Stop 70 Per Cent Waste of Thermal Efficiency in Waterjackets and Exhaust

CLEVELAND, Sept. 21.—President Charles F. Kettering started the winter circuit of S. A. E. Section meetings here to-night by one of his interesting talks on aviation, engine fuels and other matters dear to his heart. As in other talks, he did not mince matters and struck straight from the shoulder.

"The internal combustion engine is understood in general, but in fuel and efficiency problems special attention must be focused on it. Our engines are not efficient. We must design engines that will use fuel more economically and not throw away 40 per cent of its thermal efficiency through the water jackets and 30 per cent through the exhaust, as is done to-day.

"In considering the motor and the fuel the engineer must think fundamentally. Given an engine he must make fuel to fit it. Tests were made at the Dayton laboratories with various kinds of fuel. One test was made to find out why kerosene could not be used. These tests disclosed that kerosene knocks were not premature. They always occurred 20 deg. after the piston was on its downward course and 50 deg. after ignition.

"Observations were made through a glass-covered opening in the cylinder and every knock displayed a carbonized flame within the casing.

"There is much talk of the airplane industry after the war. It may or may not be a great development. The present cost of an airplane engine is from $10 to $20 per horsepower. This is quite high. If someone can design one at a couple of dollars per horsepower a great future is in store for the industry.

"The fundamental problems in airplane construction are weight, horsepower and fuel consumption. These travel in a circle. If it is desired to increase the carrying capacity of a machine while maintaining a given ceiling, larger wings are needed. This, in turn, demands increased horsepower, which necessitates the use of more fuel. This again adds to the weight and the wing surface must be again enlarged, and so on. The problem resolves itself into one of fuel economy and decreasing the weight of the engine.

"The Liberty engine weighs 825 lb. It is necessary to carry 0.7 lb. per horsepower for cooling, making a total of 280 lb. The question is, first, how much weight per square foot is the plane intended to carry, and next, what is the maximum of speed of travel desired? That will determine how much engine is required.

Commercial Airplane Possibilities

Whether or not future airplanes will carry freight depends upon what the cost can be made per ton mile. Should we arrive at a satisfactory cost it will be necessary to establish airplane roads to guide the planes. Being at a high elevation, pilots of planes would experience difficulty in identifying markings (numbers) on the ground or on top of structures. In unsettled weather conditions they would be traveling above the clouds, making this method of markings further ineffective. The only manner in which planes could be efficiently directed over a route would be by wireless. Each station would have its own number which would be caused to register as the plane passed over it.

"Practically all the laws of aerodynamics are clear. Stresses are understood; materials are known, although there may be a question as to whether metal or wood is better. Someone may come along with a new treatment of metal which may revolutionize the whole thing."

President Kettering mentioned the untruthful reports that came back here following the arrival in Europe of the redesigned De Haviland 4. He declared that Pershing as a matter of fact did not know they were there.

The reports claimed that this type of plane would be unsatisfactory because the gas tank was not large enough, because the wing covering was sewed on improperly, because there was the wrong kind of splice and because there was no stabilizer brace on the tail (which later was affixed). Shortly afterward, however, word was received that "since the above telegram was sent it has been given by direct information that the D. H. plane is the best and that the Liberty engine is the best in Europe. To-day airplanes are given priority above food and soldiers. It is said that if the war lasts 2 years more the Liberty engine will be the only one used. One thousand engines are going over every week. At first two spares were sent over for every plane, later two engines were sent for two planes, and soon it will not be necessary to ship spares; every engine will mean a plane. By Jan. 1 1200 planes a week will be shipped.

Their average life at the front is 60 days.

It now takes only 14 days from the time the tree is cut for a piece of wood to be turned into a wing beam, as compared with 9 months a year ago.

—

Where Shop Training Can't Be Done

THERE are some shops in which, from the very nature of the conditions that exist, it is impossible to train new employees as they should be trained except in special training departments, says H. E. Miles, chairman of the Section in Industrial Training of the Council of National Defense.

If the spirit of the factory is bad, if there is much confusion, wastage, stalling and nervous strain, then even the simplest thing can better be taught in a special training department.

To illustrate: Four girls were trained (on difficult work, in this case) and on going into the shop earned an average of $7 the first day, $8 the second, $9 the third, and a little later $11. A sub-foreman then told them that they must stop at about $6, for the men around them would not stand for more. Nothing could be taught at machines in such a factory work-place; for instruction includes the development of war spirit, speed and accuracy, and must be given in an atmosphere and surrounding surcharged with these virtues. Incidentally, the director of training in this shop says the girls will maintain their $11 average with the prospect of being ostracized for so doing.

It is said that a barber or street car driver, with a kit of tools of a sort that gave him character, secured a job as a machine hand in a great New England factory and held it for four days before he was discovered. That would be a poor place to train in.

The company has since put in a training department where it instructs at the rate of 50 men per day, two days each, in very accurate machining, but with such perfection of stops and other fool-proof appliances as make two days enough.

In another factory employing some 4000 men and needing 3000 more, an operator called to the foreman, "Come and tell me how to do this." Said the foreman, "Weren't you hired as an all-round toolmaker?" "Yes." "Then, d—— you, bore that or get out." He got out and later explained, "I am an all-around toolmaker. I was ordered to bore out a 75-mm. cannon. I never saw one in my life and I didn't propose to spoil the first one for want of advice."

You couldn't teach in such a shop. They plan to put in a training room for simple as well as difficult operations.

The Theoretical Indicator Diagram

SECOND INSTALMENT

By O. A. Malychevitch, E. S. A., C. M.

THE following data were obtained by competent investigators:

TABLE III

	Method of Determination	Type of Engine	Compression ratio	Temperature T_a° abs
Prof. Dalby	Pyrometer	Gas engine.	4.6 :1	398
Der Oelmotor	Pyrometer	Mercedes	4.7 :1	393
Prof. Hopkinson	Deduction	Gas engine.	6.3 :1	375

It is desirable that the temperature of the inlet gases be as low as possible, as this item, together with the compression ratio and the thermal efficiency, greatly affects the engine output.

T_a — the inlet temperature diminishes with an increase in the compression ratio, as this diminishes the quantity of burnt gases remaining in the cylinder and the effect of their high temperature.

P_c = the compression pressure:

$$p_c = p_a e^n \tag{13}$$

$T°_c$ = the compression temperature abs.:

$$T_c = T_a e^{n-1} \tag{14}$$

where p_a and T_a are the suction pressure and temperature abs. respectively, e is the compression ratio, $n = 1.35$.

P_z = explosion pressure:

Applying Charles's law to the working mixture

$$P_c V_c = R_1 T_c$$

and to the burnt gases

$$P_z V_z = R_2 T_z$$

But according to (equation 10),

$$R_2 = \delta R_1$$

So that

$$P_z V_z = \delta R_1 T_z \text{ or}$$

$$\frac{p_z V_z}{\delta p_c V_c} = \frac{T_z}{T_c}$$

If we assume that $V_c = V_z$ we get:

$$p_z = \delta p_c \frac{T_z}{T_c} \tag{15}*$$

*At constant volume:

$$P_z = \delta V_c \frac{T_z}{T_c}$$

P_e = pressure at the completion of the expansion

$$P_e = \frac{P_z}{e^n} \tag{16}$$

$T°_e$ abs. = temperature at the completion of the expansion

$$T_e = \frac{T_z}{e^{n-1}} \tag{17}$$

Experiment tends to show that the compression ratio is the only factor having an influence on the temperature T_e.

Equations (1) to (17) give the necessary data for constructing the theoretical indicator diagram and for calculating the working process of the engine.

Automobile engineers are very skeptical regarding this method and the writer's own experience enables him to appreciate their viewpoint, which is a result of the application of old formulæ without any concentrated effort to develop a method for the collection of scientific and experimental data.

*We know nothing definitely about the temperature T_r, but it is certain that T_r depends on T_e, the temperature at the end of expansion and very probably it is not very much lower than T_e.

We will now work out a practical example, illustrating the calculation of the working process of a four cycle engine.

We will select a four-cylinder engine of 90 mm. bore and 180 mm. stroke (Fig. 2).

Piston displacement ..... $V_h = 1145$ cm³
Volume of compression chamber $V_c = 286.25$ cm³
Total volume ..... $V = 1431.25$ cm³
Compression ratio:

$$\varepsilon = \frac{V_h + V_c}{V_c} = \frac{1145 + 286.25}{286.25} = 5 \tag{18}$$

Pressure previous to compression..... $P_a = 0.87$ at.
Initial pressure of working mixture..... $p_o = 1.00$ at.
Pressure of burnt gases in the cylinder.... $P_r = 1.05$ at.
Initial temperature..... $T_o = 290°$ abs.
Temperature of exhaust gases remaining in the clearance space..... $T_r = 1070°$ abs.
Heating value ..... $H_g = 10{,}500$ cal/kg.
Air/gasoline ratio ..... $A = 16:1$
Ratio

$$\frac{\text{specific heat at const. pressure}}{\text{specific heat at const. volume}} = n = 1.35$$

By equation (12):

$$T_a = 290 \frac{5 \times 0.87}{0.82 \times (5\text{-}1)} = 380 \text{ deg. abs. or } 107 \text{ deg. C.} \tag{19}$$

By equation (13):

$$P_c = 0.87 \times 5^{1.35} = 7.75 \text{ atm.} \tag{20}$$

By equation (14):

$$T_c = 380 \times 5^{0.35} = 660 \text{ deg.abs. or } 387 \text{ deg. C.} \tag{21}$$

Coefficient ψ

Volume of working mixture at $p_o T_o$:

$$V_h \eta_e = V\left(1 - \frac{1}{\varepsilon}\right)\eta_e$$

Volume of working mixture in cylinder at $p_a T_a$:

$$V_a = V\left(1 - \frac{1}{\varepsilon}\right)\eta_e \frac{p_r T_a}{p_a T_o}$$

The volume of exhaust gases remaining in the cylinder at $p_a T_a$ is $V—Va$

$$\text{Therefore } \psi = \frac{V - V_a}{V_a}$$

Inserting the value of V_a and the value of T_a/T_o from equation (12) we get:

$$\psi = \frac{p_r T_o}{\eta_e (\varepsilon - 1) p_o T_r} \tag{22}$$

$$\psi = \frac{1.05 \times 290}{0.82 \times 4 \times 1070} = 0.09 \tag{23}$$

By equation (4) we may find the number of kg.-mol. (K_1, K_2, K_3) of the three components of the working mixture and burnt gases.

Reaction I:

Carbon dioxide: $C + O_2 = CO_2$:

Number of kg.-mol. of oxygen required for combustion = 1.

Number of kg.-mol. of carbon dioxide developed = 1.

Change of gas kg.-mol. $dK = O$. (24)

Reaction II:

Water vapor: $H_2 + \frac{1}{2}O_2 = H_2O$.

Number of kg.-mol. of oxygen required for combustion = ½.

Number of kg.-mol. of water vapor developed = 1.

Change of gas kg.-mol. $dK = +\frac{1}{2}$ (25)

i.e., the process of forming water vapor (H_2O) in burning H_2 gives the increase of volume of gas = +½.

The elements of gasoline are:

Carbon C

Hydrogen H

As mentioned above, we express the working mixture and burnt gases in kg.-mol., taking as a unit the number of kg. equal to the molecular weight of gasoline.

The molecular weight of carbon is 12 and that of hydrogen 2, therefore the number of kg.-mol. of 1 kg. will be:

$$K_2 = \frac{C}{12} \quad (26)$$

$$K_1 = \frac{H}{2} \quad (27)$$

By equation (25) the increase in the volume of gas or kg.-mol. for $H_2 = +\frac{1}{2}$. Then the increase for $H = +\frac{1}{4}$ and

$$dK = +\frac{H}{4} \quad (28)$$

Therefore the sum of kg.-mol. of the components of the working mixture will be

$$K_1 + K_2 + K_3 = \frac{A}{28.89} + dK \quad (29)$$

where $\frac{A}{28.89} + dK$ is the number of kg.-mol. of working mixture.

From equation (29) we have

$$K_1 = \frac{A}{28.89} - \left(\frac{C}{12} + \frac{H}{4}\right) \quad (30)$$

Substituting the value of equations (3) and (26), (27), (30) in equation (4) we will obtain equation (5).

$$C_{mv} = K_1 \times C_{v_1} + K_2 \times C_{v_2} + K_3 \times C_{v_3} =$$

$$= \left\{\left[\frac{A}{28.89} - \left(\frac{C}{12} + \frac{H}{4}\right)\right]\left[4.625 + 0.00053T\right] + \right.$$

$$\left. + \left[\frac{C}{12}(6.774 + 0.00189T) + \frac{H}{2}(6.855 + 0.00116T)\right]\right\} =$$

$$= (0.160A + 0.180C + 2.271\text{H}) +$$

$$(0.018A + 0.113C + 0.448H)\frac{T}{1000} \quad (31)$$

This is the equation of the total specific heat of working mixture. It may be applied to the case of fuel naphtha and kerosene as well as to gasoline.

Gasoline consists of 85 per cent carbon and 15 per cent hydrogen, and these elements are mixed with 16 times their weight of air. Substituting these values in equation (31) we get the total specific heat of the working mixture (gasoline).

$$C_{mv} = (0.160 \times 16 + 0.180 \times 0.85 + 2.271 \times 0.15) +$$

$$(0.018 \times 16 + 0.113 \times 0.85 + 0.448 \times 0.15)\frac{T}{1000} =$$

$$3.053 + 0.451\frac{T}{1000} = L + MT \quad (32)$$

Substituting the values of equation (32), (23) and (8) in equation (9) we get

$$0.70 \times 10{,}500 + 1.09\left(3.053 + 0.451\frac{660}{1000}\right)660$$

$$= 1.09\left(3053 + 0.451\frac{T_z}{1000}\right)T_z \quad (33)$$

from which $T_z = 2150$ deg. abs. or 1877 deg. C.

From equations (11) and (28) we find:

$$\delta = 1 + \frac{7.22 \times 0.15}{16(1 + 0.09)} = 1.1 \quad (34)$$

From equations (15) and (34)

$$P_z = 1.1 \times 7.75\frac{2150}{660} = 29 \text{ atmospheres} \quad (35)$$

From equation (17)

$$T_e = \frac{2150}{50.35} = 1200 \text{ deg. abs. or } 927 \text{ deg. C.} \quad (36)$$

For values of T_e see Table IV.

TABLE IV.

Compression rates ε	4	5	6
Temperature T_e^0 abs.	1100,	1070,	1050

From equation (16)

$$P_e = \frac{29}{5^{1.35}} = 3.3 \text{ atm} \quad (37)$$

Theoretical mean indicator pressure

$$p_i = \frac{p_c}{\varepsilon - 1}\left[\frac{p_z}{p_c}\frac{1 - \frac{1}{\varepsilon^{n_2-1}}}{n_2 - 1} - \frac{1 - \frac{1}{\varepsilon^{n_1-1}}}{n_1 - 1}\right] \text{ or}$$

$$p_i = \frac{p_c}{\varepsilon - 1}\left(\frac{p_z}{p_c}X - Y\right) \quad (38)$$

where: $X = \frac{1 - \frac{1}{\varepsilon^{n_2-1}}}{n_2 - 1}$ and $Y = \frac{1 - \frac{1}{\varepsilon^{n_1-1}}}{n_1 - 1}$

The value of X and Y are given in Table V.

n	Compression Ratio E			
	4.5	5.0	5.5	6.0
1.30	1.20	1.26	1.33	1.38
1.35	1.14	1.22	1.28	1.33
1.40	1.12	1.18	1.25	1.27

$$p_i = \frac{7.75}{4}\left(\frac{29}{7.75} \times 1.22 - 1.2\right) = 7.5 \text{ atmospheres} \quad (39)$$

Taking into consideration that the exhaust valve begins to open before the power stroke is completed, the pressure of resistance of the suction and exhaust stroke and delaying combustion it is necessary to make correction:

$$P_i = p_i \times \delta \quad (40)$$

where $\delta = 0.90 - 0.95$.

$$p_i = 7.5 \times 0.93 = 7 \text{ atmospheres} \quad (41)$$

The fuel consumption per ind. hp.-hour

$$F = 9220\frac{p_o\eta_e}{T_o p_i A} \quad (42)$$

$$F = \frac{9220 \times 0.82}{290 \times 7 \times 16} = 235 \text{ gr. per hp.-h.}$$

The fuel consumption per C. hp.-h. is

$$\frac{f}{\mu_m} = \frac{235}{0.86} = 275 \text{ gr., and}$$

$$\frac{f}{\mu_m} = \frac{235}{0.62} = 380 \text{ gr.}$$

where μ_m = mechanical efficiency = 0.62 — 0.86 (see Fig. 1).

Equations (18) to (42) determine the theoretical indicator diagram presented in Fig. 2.

TABLE VI—VALUE $\alpha+\beta$ FOR $n=1.1.-1.4$

$n+$	1.10	1.15	1.20	1.25	1.30	1.35	1.4
Angle α +	11^{20}	11^{20}	11^{20}	14^{05}	14^{05}	14^{05}	18^{25}
Angle β	$12^{0}38'$	$13^{0}10$	120	17^{48}	18^{40}	19^{25}	26^{30}
$tg\alpha$	0.2-1:5	0.2	0.	025-1:4	0.25	0.25	0.33-1:3
$tg\beta$	0.222	0.234	0.245	0.322	0.337	0.352	0.497-1:2

In Fig. 2 line OV represents volumes $V_c = 286.25$ cc. and $V_h = 1145$ cc. Line OP represents pressures in atmospheres and temperature in degrees abs. It is advisable to make the stroke of the engine $V_h = 180$ mm. in our case. From the origin draw the line ON at an angle α of 14 deg. 5 m. corresponding to $n = 1.35$ and line ON_2 at an angle $\beta = 19$ deg. 25 min. (Table VI).

Draw point a with a co-ordinate

$$P_a = 0.87 \text{ atmosphere}$$

and

$$V = V_c + V_h = 1431.25 \text{ cc.}$$

Draw the vertical aa_2 and the horizontal aC_2.

Through the intersection of a_2 and C_2 draw the oblique lines at 45 deg. as shown (Fig. 2) and from the points b_2 and C_3 so determined draw the next set of vertical and horizontal lines. Their intersection at d determines the next point of the curve. The network of construction lines determines the polytropic line of compression ac. By the same method the polytropic line of expansion ez may be constructed.

With calculated values of temperatures, compression and expansion curves we can determine intermediate points of temperature curves a^1C^1 and e^1Z^1 by the following equations:

$$T_n = T_a \left(\frac{P}{P_a}\right)^{\frac{n-1}{n}} \text{ or}$$

$$T_n = T_c \left(\frac{V}{V_n}\right)^{n-1}$$

where P_a, V and T_a refer to the original state of the working mixture.

$$T_1 = 380\left(\frac{4}{0.87}\right)^{0.26} = 560 \text{ deg. abs.}$$

$$T_1^1 = 1200\left(\frac{18}{3.3}\right)^{0.26} = 1790 \text{ deg. abs., and so on.}$$

Points for the temperature curve may be determined graphically from the general relation:

$$PV = R_1^1 T.$$

Where R_1^1 refers to the whole mass of the gases and not to 1 kg.

From point a (Fig. 2) draw the lines $ac_2 \| OV$ and from point a^1 line a^1O to the intersection with line ac_2 at point K. It will be found that $K^1O = R_1^1$, since

$$K^1O = Oa_2\frac{KK^1}{a_2a^1} = \frac{Vpa}{Ta} = \frac{1431.25 \times 0.87}{380 \times 6.35} = 52 \text{ min.}$$

where $6.35{:}1 = \frac{V_h}{\text{stroke}} = \frac{1145}{180}$ is a scale for diag. (Fig. 2.)

Lay off on the vertical line K^1g a distance $R_1^1 = 52$ min. and from the point h of intersection with line ch draw the line hO. The intersection of hO with mz^1 determines point C^1, and so on.

In the same way we determine R_2^1.

According to equation (10):

$$R_2^1 = R_1^1\delta = 52 \times 1.1 = 58 \text{ min.}$$

Also, $l'O = \frac{l'z'' \times mO}{mz'} = \frac{p_zV_c}{T_z} = \frac{29 \times 286.25}{2150 \times 6.35} = 58$ mm.

Lay off the length $l'z''$ on line R_2^1 and line Oz'', determine point $z' = T_z = 2150$ deg. abs. or draw the line Oz' until it intersects with line mz'. Point z'' determines the explosion pressure $p_z = 29$ at. Point S, S', the intersection of line Oz''-Ot with the expansion curve ez, gives the necessary correction for delayed combustion in the theoretical indicator diagram for maximum pressure and temperature.

The above-mentioned corrections have practically no influence on the area of diagram, the character of the expansion line and the fuel consumption. The result can be made still more valuable if the calculations are carried through for different air-gasoline ratios and different heating values of the fuel.

It seems apropos to explain the derivation of the fuel consumption equation (42).

The indicated work of 1 kgmol. or 1 kg. of fuel per I. H. P. hour is

$$N_i^1 = \frac{p_i^1 \times V_i \times 1000}{75 \times 60 \times 60} = \frac{P_i^1 \times V_i}{27}$$

$$\frac{28.89}{1.293} = 22.33 \text{ cu. m.}$$

where V_i is the piston displacement for 1 kgmol. or 1 kg. of fuel in cu. m.

p_i^1, the corrected theoretical mean indicator pressure (equals 40, 41).

To find the value of V_i we proceed as follows:

The volume of 1 kgmol. of air at p_o, T_o is

28.89 being the weight of 1 kgmol. of air and

1.293 being the weight of 1 cu. m. of air in kg. at 0° and 760 mm.

(22.33 cu. m. is the volume of 1 kgmol. of all gases.)

The volume of 1 kgmol. of gas at p_o, T_o is

$$\frac{22.33 \times 1.0334 \times T_o}{p_o \times 273} = 0.0846\frac{T_o}{p_o} \text{ cu. m.}$$

1.0334 kg. per sq. cm. being the atmospheric pressure at 760 mm.

The volume of working mixture at p_oT_o (for 1 kgmol. or 1 kg. of fuel) divided by the volumetric efficiency η_e gives

$$V_i = 0.0846\frac{T_o}{p_o} \quad \frac{A}{28.89 \times \eta_e} \text{ for 1 kg. of fuel}$$

where A is the ratio of air to gasoline (16).

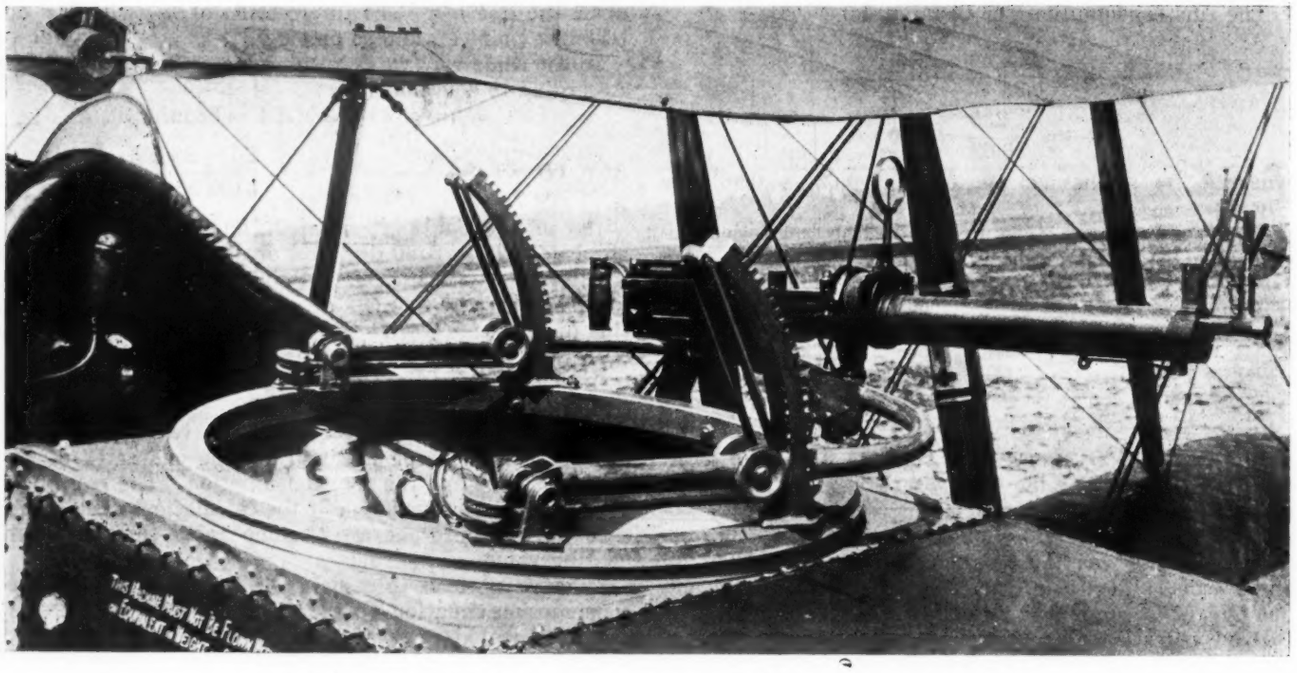
Substituting the value of V_i in the expression for N_i and taking $\frac{1}{N_i}$ we get the fuel consumption in kgmol. or in kilograms per indicated horsepower-hour—

$$N_i = \frac{p_i^1 \times 0.0846 \times T_o \times A}{27 \times p_o \times 28.89 \times \eta_e}$$

Fuel consumption per indicated horsepower-hour:

$$F = \frac{1}{N_i} = 9220\,\frac{p_o \times \eta_e}{T_o \times p_i^1 \times A} \qquad (42)$$

$$\text{or } F = \frac{9220 \times 0.82}{290 \times 7 \times 16} \quad \ldots \text{ and so on.}$$



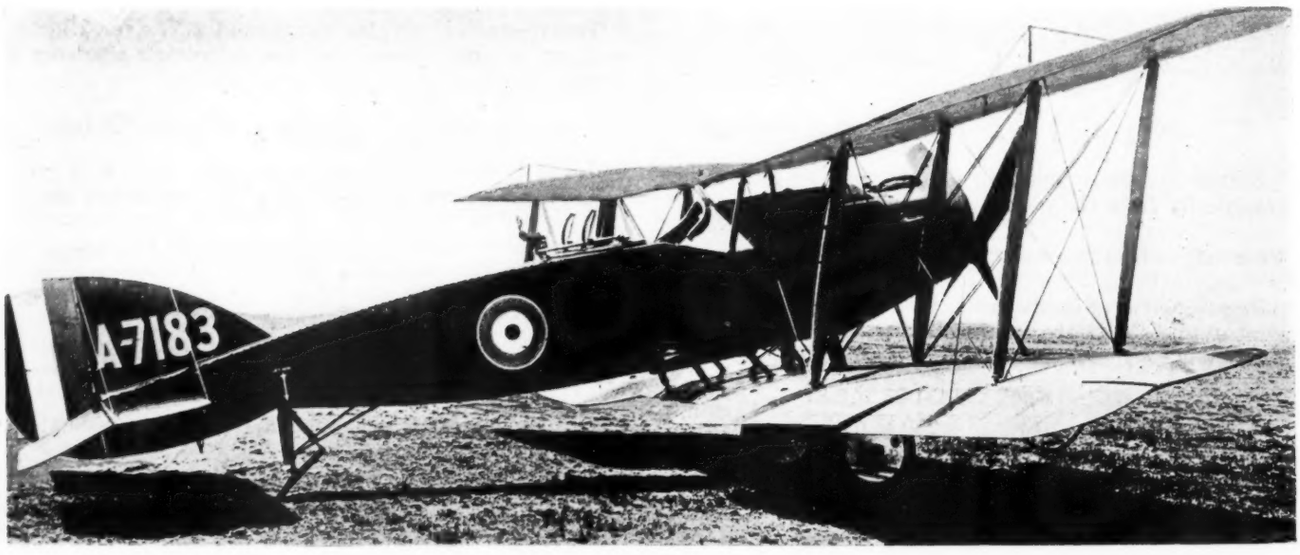
Machine gun mounting on a turret surrounding the observer's cockpit

The Bristol Two-Seater Fighter

ONE of the fastest machines used by the British air force is the Bristol fighter, a two-seater tractor biplane. It has been fitted with a number of different engines, including the 190-hp. Rolls-Royce, the 150-hp. Hispano-Suiza, the 200-hp. Hispano-Suiza, and the 200-hp. B. H. P. The armament of this machine consists of one synchronized Vickers machine gun, operated by the Constantinesco interrupter gear, and one Lewis gun, on a ring mounting. For the Vickers 88 rounds of ammunition are carried, and for the Lewis 7 drums. This machine has a total weight of 2779 lb. and an endurance of 3 hours' flight at 10,000 ft., including the climb. Its ceiling is 20,000 ft. At the ground level the speed is 119 m.p.h., and at 10,000 ft. 113 m.p.h., while the time required to reach an altitude of 10,000 ft. is 13 min.

The Bristol Fighter has a span of 39 ft. 3 in., an overall length of 25 ft. 9½ in., and a height 9 ft. 4 in. The machine was originated by the British & Colonial Aviation Co., and made its first appearance in January, 1917. It is still being manufactured.

One of the accompanying illustrations shows a close-up view of the observer's cockpit and machine-gun mounting.



Side view of the Bristol fighter

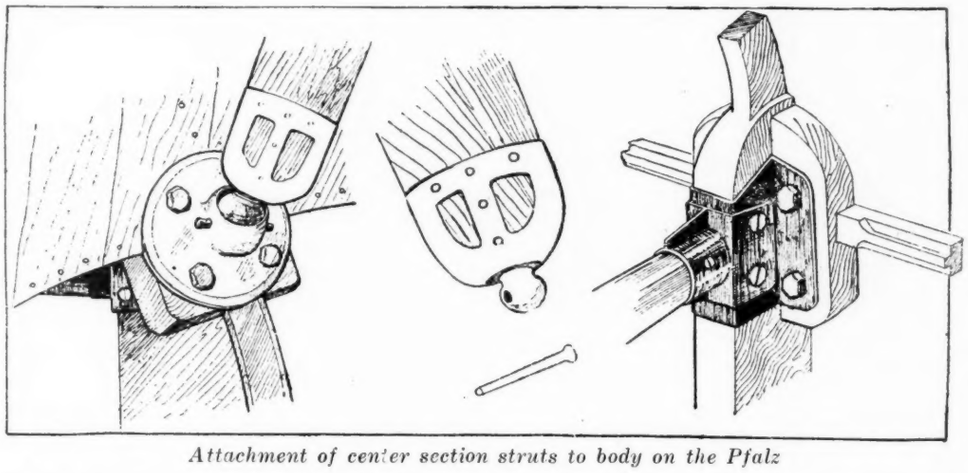
The Pfalz Single-Seater Fighter*

PART IV

Arrangement of Wings and Bracing, and Method of Attachment to Body

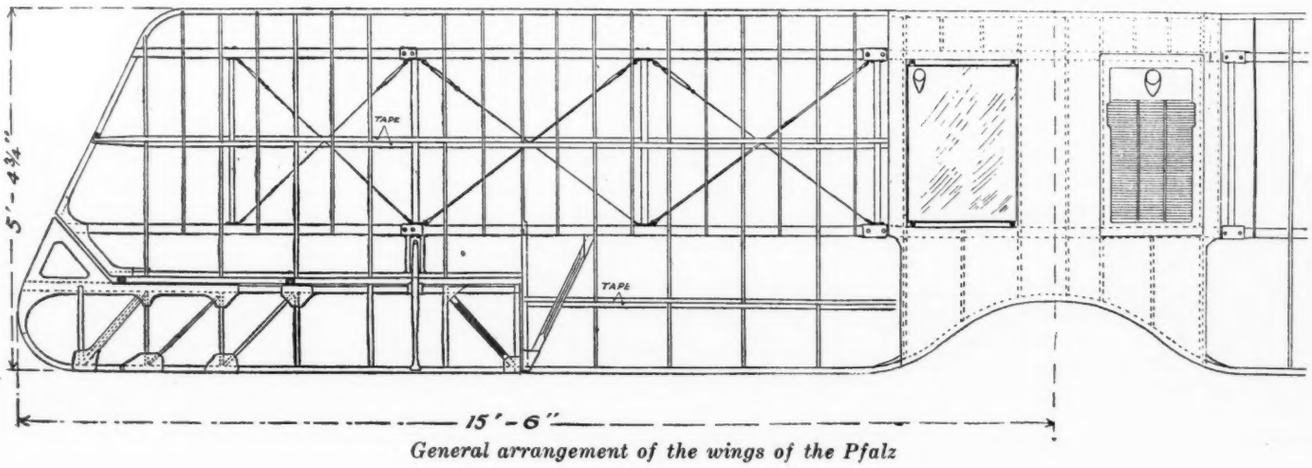
FUNDAMENTALLY the Pfalz single-seater belongs to the type frequently termed by the Germans a one-and-a-half-plane; that is to say, it is a machine having a larger top plane and a smaller bottom plane. The type was originated by the French Nieuport firm, and the first machine of this type, if not actually making its appearance, was at any rate contemplated, before the outbreak of war. Since then, although comparatively recently, the enemy has copied the type fairly extensively, chiefly in the Albatross single-seaters and in the make at present under review. Aerodynamically this arrangement of the planes is of advantage on account of the fact that in a biplane the lower plane is the less efficient, and that therefore the more of the total surface is formed by the top plane the better the overall efficiency. Practically also certain advantages attend the arrangement. The effect of the smaller lower chord is twofold. The gap between the planes need not be so great as in the case of a biplane having both planes of the same chord, and for a given fuselage depth the top plane may therefore be placed at a smaller height above the top of the body, resulting in a better view forward. Again the smaller bottom chord does not obstruct the view downward to the same extent as does a plane of larger chord. Thus the "one-and-a-half-plane" forms a good compromise between the lighter structure of a biplane and the good visibility of the "parasol" monoplane, which latter is probably unsurpassed as a fighter as far as obstructing the view in all directions to the smallest extent is concerned.

In the design of its wing structure the Pfalz shows several interesting features. The outward slope of the struts connecting the body with the top plane was originated, we believe, by the Sopwiths in their "one-and-a-half strutter," while the Vee form inter-plane struts are typically Nieuport. Constructionally, however, the Pfalz is a good deal different in both these features. The Vee struts are not strictly speaking placed in the form of a letter V, as they do not quite meet in a point on the lower plane, which has two spars instead of the single spar employed in the original Nieuport. The object of having two spars is evidently to provide a more rigid structure better capable of resisting the twisting moment due to the travel of the center of pressure. Owing to the fact that the inter-plane struts do not come to a point, incidence wires should be employed, but in their stead the struts are so built up as to form the bottom of a solid U which lends to the lower ends of the struts the rigidity usually provided by incidence wires. The same applies more or less to the body struts, which, as was shown in the illustrations published in our issue of Sept. 5, are in the form of an inverted, flattened U with its cross member adjoining the upper plane. Here, again, the construction of the struts has been designed to perform the function of incidence wires. While on the subject of these struts,

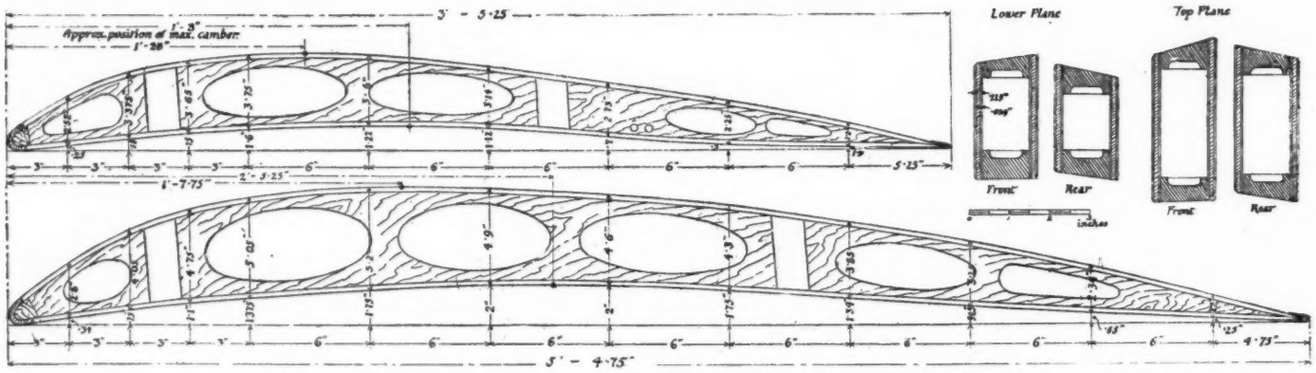


Attachment of center section struts to body on the Pfalz

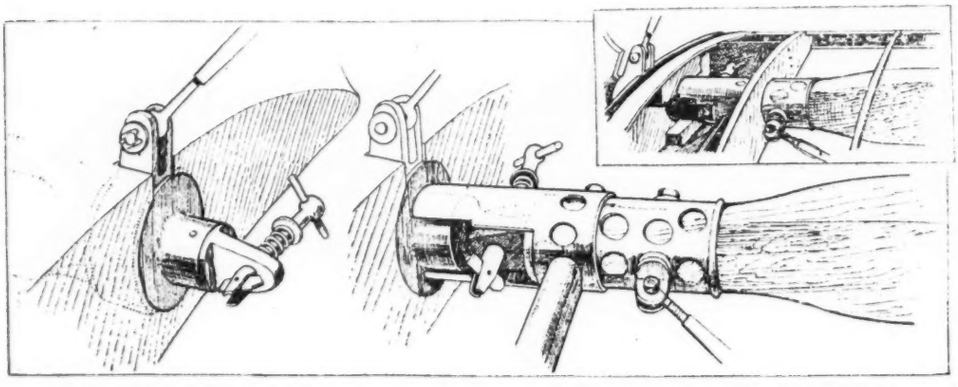
*From *Flight*.



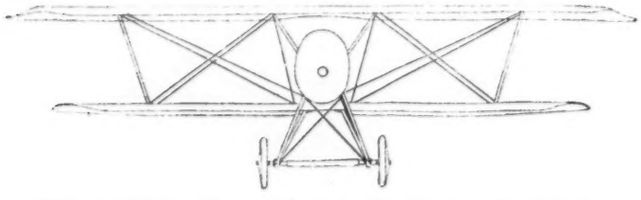
General arrangement of the wings of the Pfalz



Upper and lower wing sections of the Pfalz, with sections of the wing spars



Quick-release attachment of lower wing spars to fixed wing roots of the Pfalz



Wiring diagram of the Pfalz single-seater. The bracing of the center section struts does not run across the top of the body

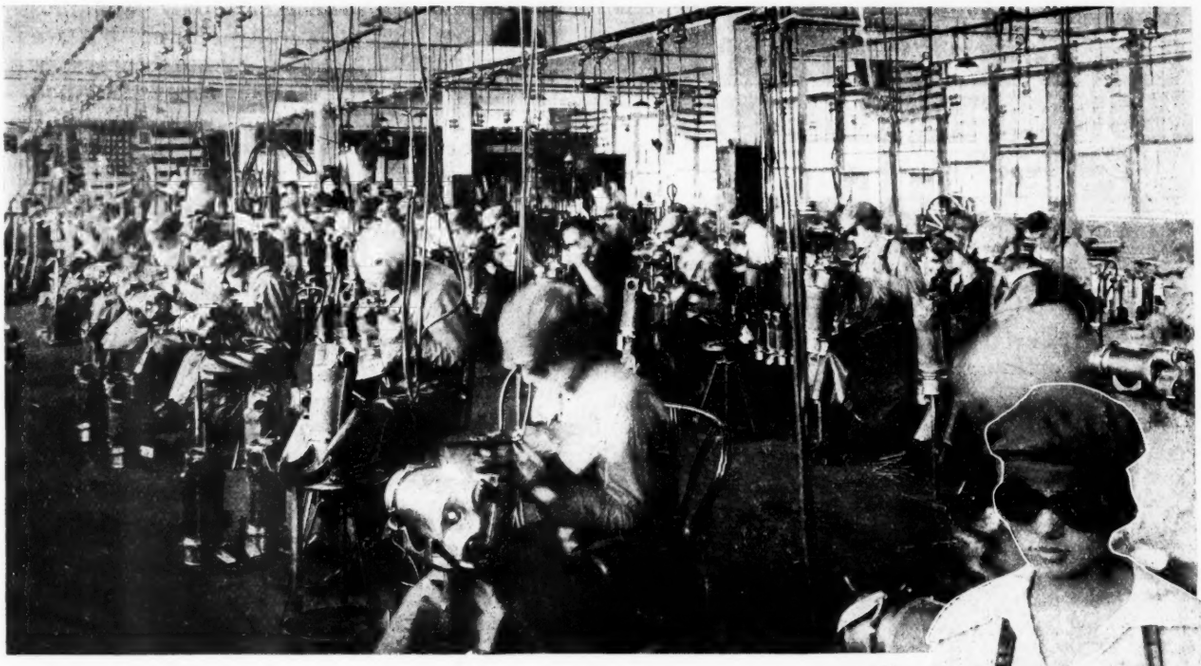
attention may be drawn to a somewhat unusual arrangement of the transverse bracing cables. Generally these run from port top rail to top of starboard body struts and *vice versa*. In the Pfalz, however, this arrangement has been discarded and the arrangement indicated in the bracing diagram herewith substituted. The cross wiring does not, it will be seen, run over the top of the body at all. Instead the cables from the upper ends of the struts on one side run to the root of the bottom plane on the same side. The body struts pivot around their attachment to the body, and any lateral displacement of the top plane would therefore result in a raising of one side or the other with a consequent tightening of the corresponding cables. From a practical point of view this arrangement of the cables would appear to possess considerable merits. The crossing of the cables above the body generally necessitates piercing of the top covering, which in most machines is raised considerably above the top longerons, to which the lower ends of the cables are usually anchored. These wires are therefore as a rule difficult to get at, and from a rigger's point of view at any rate the Pfalz arrangement appears preferable. Then again wires crossing above the body frequently interfere with the placing of the machine guns, or with the sighting tube and other accessories. Aerodynamically, it is true, the Pfalz arrangement is at some slight disadvantage, inasmuch as the length of cables exposed to the air is greater than in the case of cables crossing above the body. When, however, as in the Pfalz, the struts are designed to do away with incidence wires the total length of cables is probably no greater; so one is inclined to consider the arrangement worth while.

The general arrangement of the Pfalz wings is shown in an accompanying illustration. Ailerons are fitted to the top plane only, as is almost universal practice in Germany. They are hinged to a false spar, and have their crank levers working in slots in the plane, another feature characteristic of enemy machines. This part of the wing is reinforced extensively by the use of three-ply wood. As shown in the drawing, the petrol service tank is built into the top plane, as is also the radiator, which is provided with a shutter that can, owing to the low placing of the top plane, be operated direct from the pilot's seat, a handle projecting aft from the radiator being provided for this purpose. This central portion of the top plane is also reinforced by a covering of three-ply.

The two wing sections of the Pfalz are shown herewith. The lower section is not, it will be observed, an exact geometrical reduction of the upper one, the trailing portion of its lower surface being more in the nature of a reversed curvature than is the case with the top section. The difference does not, however, appear to be great. The maximum camber of the sections appears to be smaller than one usually finds on German machines. At the same time the camber is very considerable for a machine intended for fast flying, and it is possible that the wing section is partly responsible for the inferior performance of the Pfalz.

The wing spars of both planes are of the box form, although not, as indicated in the sections, made up in the usual way of two channel sections joined by a hardwood tongue and grooves. The flanges of the spars are of spruce, and of the section shown in the illustration. Front and rear faces of the spars are formed by plies of wood made up of two thin outer layers of three-ply with a thicker layer of spruce in between them. At points where the spars are pierced by bolts for the attachment of inter-plane struts or internal compression tubes, the space between top and bottom flanges is filled up solid by packing pieces. The attachment of the spar webs to the

(*Continued on page* 565)



Two Things That Women Didn't Do Before the War

THESE photographs, taken in the Packard plant, show how women have been trained as welders in the Liberty Engine Department. Experience has shown that while welding is an operation which women learn more slowly than they do most others, they nevertheless acquire gradually a high degree of skill, and are, as a class, more careful with their work than men.

At the left are shown new women employees at the Packard plant being trained for places in the body trimming department. Training and production go along together.

AUTOMOTIVE INDUSTRIES
The Automobile

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Tractor Sales Representatives

A RECENT investigation of the tractor sales situation in the Middle West disclosed the fact that the majority of tractors are being sold by automobile dealers. Many of these in the past were implement dealers, but when automobile development made possible the sale of large numbers of these vehicles among farmers these dealers recognized the opportunity and took advantage of it with the results that now their automobile business greatly exceeds their implement business. The advent of the automobile in the agricultural sections put the implement trade through a process of natural selection. The wide-awake, enterprising, progressive implement men became automobile dealers, while the slow, conservative element in the implement trade stuck to its old line and to the somewhat out-of-date service methods peculiar to it.

When, later on, the farm tractor became a practical proposition it was an easy guess which of the two classes of dealers would be first to take up its sale. The automobile dealer not only was most eager to embrace the opportunity offered, but was most sought after by the tractor manufacturers, because of his familiarity with the service methods current in the automobile business and his ability to render similar service to tractor customers.

So much for conditions in the Middle West. In the Eastern territory tractor sales development has presented a somewhat different aspect, owing to the predominance of our city population. Passenger cars have been sold mainly in the cities, and until recently our metropolitan dealers did not think of taking on more "essential" lines, to use a term made familiar by war conditions. Motor trucks, too, have been sold chiefly in the large cities, but, with a certain number of exceptions, truck sales agencies have been kept separate from passenger car agencies. The average metropolitan truck dealer has probably done as good a business during the past year as during any previous period and has not been looking for new lines. Business in passenger cars has fallen off greatly, but neither his location nor his previous business experience fit the metropolitan automobile dealer specially as a tractor sales representative.

These remarks are not made to disparage those people who have established general distributing agencies in New York from which to organize local agencies. But the opportunities for direct sales from a city branch are very slight, as experience in the West, where most tractors have been sold so far, has shown that farmers almost invariably buy from their nearest dealer, no doubt because from him they can expect the promptest service. During the period of the war we may materially expect to see certain abnormal developments, but after the return of normal peace times we do not expect to see any tractor salesrooms along Broadway.

Tractor manufacturers who cater particularly to the Eastern trade have found that agents for popular-priced cars in country towns make the most successful tractor dealers. They are close to the farmer, they have the necessary service facilities, and since the curtailment of passenger car production they have been looking for new lines.

The Employer's Responsibility

THE fact that the Government has organized the United States Employment Service does not by any means relieve the employer of the very great responsibility of putting his employment practices on a scientific basis. His local employment board will not consider it a recommendation for any employee to learn of him that he still adheres to the antiquated hiring and firing method of handling his labor problems. In expecting the co-operation of the Government employment agencies, he must know that he is expected to do his utmost to keep turnover at the lowest possible point and to maintain proper working conditions. It has been demonstrated repeatedly that the surest way to secure these results is to install a central employment department equipped for the prompt discovery and analysis of unfavorable working conditions.

$6,000,000,000—The Civilian Soldier's Task

THERE is no higher spirit in man than that of self sacrifice.

It is a sublime gift bestowed by the Creator on man.

The time has arrived, as never before in our lives, when we can show this spirit of self sacrifice.

The Fourth Liberty Loan offers this opportunity.

Each manufacturer must consider it his especial opportunity. It is akin to the tide of opportunity that Shakespeare speaks of which comes in the life of every man and which if taken advantage of leads on to fortune, but if neglected lands us in shallow shoals.

The three former Liberty Loans have been mere training schools for this grand and glorious opportunity. This is the opportunity supreme and to many it will be the test supreme.

Six billions is a good round sum, but a sum that is as nothing when the object for which it goes is considered.

In the past Liberty Loan drives we have purchased bonds, but that is only passing credit to us. They have been good investments. We did not have to purchase until the purchase pinched and pinched hard, but in this six billion drive there is going to be some pinching.

There may be pinching but there must be no flinching

No civilian soldier at home living in his house of comfort, living amidst his friends as he has done for years, using his automobile six days in the week, going to the theatre or movies as he has been in the habit of going, and in general eating more sanely for his own benefit, can even think of flinching.

These six billions are needed for those who in khaki are ready without a whimper, without a flinch, without an excuse and with a smile on their faces to make the supreme sacrifice.

They have left the comforts of home behind. They have severed family circles. They have sacrificed good positions. Some of their families have moved from good homes into smaller and more humble ones. Some of their families have moved from front apartments in good streets of our cities into very inferior ones.

They have done theirs, and now it is our turn.

Manufacturers must not only do their duty in this Liberty loan so far as their corporation is concerned, but also so far as every employee is concerned. Wages have increased 80 per cent and living expenses have increased but 60 per cent. Such employees cannot flinch.

Every factory organization should card index every employee.

His capacity to purchase Liberty Bonds should be investigated to the last syllable.

We expect every soldier in France, in Russia, or in any other country where we are fighting, to take his place in the ranks. He must answer the roll call.

At home, every factory employee must answer to the Liberty bond roll call.

Any employee who does not buy should show the reason why.

In a democracy, we cannot have one rule in war time for soldiers and another code of ethics for civilians.

The army in the factories at home must do its duty as faithfully to the very letter as the army at the front or in the training camps.

Every workman who owns a Liberty bond is a better workman for owning it. He becomes a stockholder with Uncle Sam in this country. Every stroke of efficiency comes back to him in dividends.

For the next four weeks it is our duty to civilization to do our utmost to successfully put the six billion loan across.

This is our opportunity.

□ Latest News of the

Truck Curtailment Protest

Many Makers Call Plan Unjust —Would Benefit Those Having War Work

WASHINGTON, Sept. 21 — Protests from truck manufacturers regarding the ruling of the War Industries Board, limiting the production of motor trucks during the last 6 months of 1918, to one-third of the total production for the 18 months preceding that period, are still being made. Individual truck makers have in many cases laid their complaints before Washington authorities, and from many sections of the country come representatives giving indications of how the allotment is going to affect them.

So far as a great many makers are concerned the situation is very serious. Take the case of a manufacturer who has been allowed approximately 1200 trucks from July 1 to December 31, and who has already shipped over 900. This means that he cannot possibly retain his organization during the remaining months of the year on a 300 truck program. Such a manufacturer has pretty nearly his complete stock on hand, and while it has been suggested that he could hold the stock and not use it until after January 1, it must not be forgotten that the stock has to be paid for. This introduces a financing problem which is not a very easy one.

Many similar examples could be cited, which would seem to indicate that the allotment for the truck companies for the 6 months is such that the organization could hardly be kept intact during the remainder of the year. The overhead would be so heavy as to make this scarcely possible.

This reduction program, in view of the fact that motor trucks have been declared essential, seems certain to work special injury to truck companies not engaged and filled up on Government truck work. These companies have been preparing for the commercial demands of the country, which the companies going 100 per cent on Government work have not been able to take care of. The ruling seems to play strongly into the hands of these truck makers, as it can only be interpreted as cutting down the commercial field of the manufacturer who has not the Government work. In other words, while one group of truck makers is engaged on profitable war work, rulings are made to restrict the business of those who are taking care of the commercial field. With trucks classed in the essential column, it is difficult to see the underlying reason for this action.

C. C. Hanch, chief of the Automotive Products Section, stated yesterday that he has been given latitude by the War Industries Board, which will allow him to enlarge or decrease the apportions for production for truck makers during the last half of 1918. By this means he expects to give aid to the truck makers who have only been in business a short time, and also to make reasonable adjustments to those manufacturers who believe that their apportionments under the original ruling of one-third of the last 18 months' business would be unfair. Truck manufacturers are hoping that through Mr. Hanch's efforts a reasonable adjustment can be effected.

A number of unjust results are reported by the truck makers who object to the ruling. They cite the instance of the manufacturer who has only been in the truck making business for the last year or the last year and a half, and who, under the ruling, would be allowed only a very small amount of trucks at this time. Again, there is a manufacturer who was unable to secure his materials because of the many difficulties during the last winter, and consequently had to cut down his production. He now has the materials after much expenditure of effort and money, and also has the orders, but owing to the ruling, is limited in his output.

This ruling came as a great surprise to the general industry. Following all of the previous declarations of the War Industries Board affirming the essentialness of the motor truck, it has been difficult to understand the exact reason for this latest move. Inquiry at the Automotive Section of the Board developed two possible reasons: (1) It was said that the motor truck is not, outside of war work, declared essential by the War Industries Board.

(2) It was stated that patriotic manufacturers engaged in truck work for the Government should be protected during the war against manufacturers building trucks for commercial purposes.

The latter reason scarcely deserves consideration. It is hardly believed that this was stated seriously. It is well known that all of the truck manufacturers have been anxious to secure Government work, and have patriotically, and for excellent business reasons, endeavored to secure war contracts. Also, it is a question whether it is within the function of the War Industries Board to control general industrial and commercial business for the sole reason of "protecting" war manufacturers.

The first assertion that motor trucks for commercial or industrial purposes had not been declared essential by the War Industries Board is a surprise. As early as June 26 the War Industries Board stated in a letter signed by the Vice Chairman of the Priorities Committee:

"We beg to advise that the Priorities Committee views the motor truck in most instances as being a helpful medium, particularly at this time, and are not disposed to hamper the production of same."

Later, on Aug. 8, the War Industries Board issued Circular No. 11, stating:

"Careful consideration has been given to the several problems, and a decision reached that motor trucks, in so far as they are used directly or indirectly for war purposes, are

(*Continued on page* 567)

Glover Heads Motor Division

Has Charge of Procurement of Motorized Vehicles—Three Separate Branches

WASHINGTON, Sept. 25—Organization of the Motors Division of the Quartermaster Corps, which has charge of motor propelled vehicles, has been completed. This division procures the motorized vehicles for the Motor Transport Corps, which has charge of maintenance, operation and engineering.

Colonel Fred Glover of the Quartermaster Corps, formerly general manager of the Emerson-Brantingham Agricultural Implement Manufacturers, Rockford, Ill., is the chief of the Motors Division. Major Guy Hutchinson, formerly an automobile dealer in New York City, is the executive officer. Colonel E. S. George is the assistant chief of the division. Major A. H. Zacharias, who several years ago was connected with a pressed steel company, is the production assistant. Major C. S. Dahlquist, formerly of the Timken Detroit Axle Co., is the technical assistant.

The division comprises three branches, procurement, administrative and district offices. The procurement branch is organized in sections as shown below.

Captain Finkenstadt, given herewith, was formerly assistant to Christian Girl, president of the Standard Parts Co., assistant to Mr. Girl when he was in charge of Army truck production, and later was in charge of B truck production, following Mr. Girl's resignation. By this new organization he has been placed assistant to Major A. B. Browne. Mr. Morrison was connected with the Highland Body Co. Mr. Hess was formerly with the Cleveland Motorcycle Co. All of these men named here together with their connections were formerly connected with the Motor Transport Service under Christian Girl.

The administrative branch is under Captain S. P. Dean and includes: Office control, under Captain A. D. Stansell; personnel, W. A. Dickey; clearances, D. G. Blair; finance and statistics, A. G. Drefs; trucks, Captain H. M. Lowy.

(*Continued on page* 567)

Organization of the Motors Division of the Quartermaster Corps

Section	Officer in Charge	Assistants
A and B trucks	Maj. A. H. Browne	Capt. E. R. Finkenstadt
Militor trucks	Capt. A. C. Keleher	A. D. Bolton
AA trucks, ambulances, automobiles	Maj. W. T. Fishleigh	Capt. W. G. Stoner
Special vehicles, motorcycles, bicycles	Maj. R. Miller, Jr.	
Spare parts, accessories, tires	Guy Morgan	Capt. C. O. Miller
Trailers	P. W. Tracy	E. S. Church
Bodies	James Morrison	R. W. Irwin
Orders	Lt. W. J. Kennedy	Lt. T. A. Clarke
Priorities	D. F. Hess	Lt. L. J. Bulkley
Gauges	Capt. E. P. Hangliter	

Automotive Industries

Trucks Hold Destiny of Industry

Highways Transport Committee Meeting Emphasizes Importance of Highway Haulage

WASHINGTON, Sept. 21—*"The world is never more than 60 days ahead of famine between harvests, and great starvation areas will develop in Europe.*

"Fifty per cent of our perishables raised on the farms never reach the consumers. We lost 40 to 60 per cent of our potatoes yearly. The producers are too remote from the markets."—Herbert Hoover.

"Following the war we will develop a nation of small farming communities on new land open or reclaimed, and cultivated largely by America's war veterans. These centers will all be united by motor rural express vehicles operated over our highways. The Government intends to furnish farming opportunities for the soldiers, and we must have highways to complete such a program."—Franklin K. Lane, Secretary of the Interior.

A Trinity of Usefulness

"Our means of transportation, waterway, railway and highway are not hostile but a trinity of usefulness, but you may put six tracks on each side of the Hudson and fill it with steamships, and unless you put the inland farmer in touch with the docks and the depots neither will be useful to him."—William C. Redfield, Secretary of Commerce.

These were some of the high thoughts that are to come about because of the war and a more efficient control of highways transportation, and were given vent to at the meeting of the Highways Transport Committee held here last week, when the regional chairmen of the committee spent three days going over the work and listening to various addresses. Chairman Roy D. Chapin met with the eleven regional chairmen present and laid broad plans for a pushing of the work.

One of the possible outcomes of the meeting is action leading toward a more positive system of gasoline economy by motor vehicles. Up to date the gasoline economy program has been one of curtailment, a negative program, so to speak. The possibilities of a positive program of curtailment were outlined. This will consist of keeping motor vehicles in better operating condition so that great quantities of gasoline will be saved. Some of the regional chairmen are already arranging plans whereby they will carry on a campaign along this line through their entire area.

Herbert Hoover pledged his entire food administration back of the highway movement. "Europe is exhausting the candle of present and future resources at both ends," said Mr. Hoover, "and for 10 years after peace comes the productivity of the United States will be called upon to aid the Allies and the millions of people exploited by Germany. One of the results of a perfected highways use would be to cut down the waste of perishable foods. Besides stopping this terrific waste a highly developed rural express would work to establish lower prices. Europe has an intimate system of railway lines and canals to transport these products to nearby markets. Where the rural express has been developed in this country it has operated to these ends. I should say that the failure of public markets in this country is due to the tremendous loss of perishables shipped from remote distances. A network of rural deliveries will provide the economic basis for a successful public market.

"A further effect would be to bring into productive activity the large potential of labor now on the farm but not actively producing. Wherever mechanical transports can be employed there will be a decrease of work animals necessary. Our 25,000,000 to 40,000,000 work animals are eating the crops of an acreage that, planted to food, would sustain 40,000,000 more people."

Joseph D. Baker, of the Priorities Division of the War Industries Board, discussed the feasibility of federal license of motor car and truck drivers to conserve fuel, steel, lubricants and manpower employed in service stations. It will be recalled that earlier issues of AUTOMOTIVE INDUSTRIES predicted a probable federal license plan of this sort operated by the Priorities Division. It has been rumored for some time.

Reports made by the regional chairmen show tonnage moved over the highways increasing at a tremendous rate, in some States as much as *four hundred per cent* increase over last year being shown. The Cleveland-Akron-Canton area reported *sixty-*

(*Continued on page* 558)

—

Tom Jones Killed in Seaplane Accident

NEW YORK, Sept. 25—Tom Jones, formerly connected with J. B. Crockett & Co., exporters, and previously advertising manager of the Empire Automobile Co., who last year traveled through the Orient for the United States Government making investigations on automobile conditions, was killed yesterday at Pensacola, Fla., in a seaplane accident.

Cut Iron and Steel for Tractors

War Industries Board Limits Quantity for Next Year to 75% Used Last Year

CHICAGO, Sept. 21.—The quantity of pig iron and steel which manufacturers of tractors and other farm implements may use in the year commencing Oct. 1, 1918, and ending Oct. 1, 1919, has been limited to 75 per cent of the quantity used in the year ending Oct. 1, 1918. This action has been taken by the War Industries Board following conferences which were held last week in Washington between the War Service Committee of manufacturers of agricultural implements and farm operating equipment and Priorities Division of the War Industries Board.

Although this limitation of iron and steel will mean curtailment in the production of tractors to some extent, it is not possible to state at the present just how much the curtailment will amount to. The War Industries Board has not specifically limited the production of tractors and other implements to 75 per cent of the production during the year ending Oct. 1, 1918; instead it has merely limited the quantity of iron and steel which manufacturers of these implements may use. It is estimated that this action will release 500,000 tons of iron and steel.

Expect Relief

In its circular to the trade, the Farm Implements Committee, of which C. S. Brantingham is chairman, states that "possibly some relief may be obtained by substantial reduction of inventories by the end of the year Oct. 1, 1919," and adds "that it becomes the obligation of the manufacturer to adjust himself in the way that will serve his trade and the farmer best out of the materials allotted him."

The War Industries Board urges that a full assortment and stock of repair parts be supplied to the farmer as a means to assist and encourage him to continue to use the equipment he now owns.

—

Streator to Quit

OTTAWA, ILL., Sept. 20—A decree of foreclosure and sale has been entered against the Streator Motor Car Co., formerly of Streator, Ill. The sale is set for Thursday, Oct. 10, at Ottawa, and will involve real estate in Streator.

May Be Less Gasoline in 1919

War Demands During Coming Months May Prevent Accumulation of Surplus

Washington, Sept. 21.—The gasoline situation is serious not so much because of a present shortage as because of shortages that will occur early next year. There is a serious discrepancy between gasoline production and consumption at present, but this is not critical, as the motoring season is practically at an end and the stocks of gasoline will from this time on increase. However, it is probable that heavy drafts on the stocks of gasoline for war purposes both at home and abroad, during the winter and the spring, will prevent the usual large stocks that accumulate through the winter and will thus create a serious gasoline shortage for 1919. For this reason voluntary conservation must be practised constantly and every step must be taken not only to conserve gasoline but to increase the future supply and the supply of crude oil. These are the salient points of a report submitted by Van H. Manning, Director of the Bureau of Mines, Department of Interior, to the Senate, as a result of a resolution presented by Senator Lodge.

Figures were presented in the report showing that the monthly consumption, including exports of gasoline for August, amounted to 9,500,000 barrels as compared with a monthly production of 8,000,000 barrels, creating a shortage of 1,500,000 barrels per month comparing the demand with the production. Following is the major part of Director Manning's statement:

These figures, said Director Manning, show gasoline consumption to be seasonal, with the greatest demand in the summer, with the demand decreasing in the winter as the storage stocks increase. During the summer of 1917 storage was at a minimum and reached its maximum in March, 1918. At present gasoline stocks are falling off because the entire output of the refineries is not enough to meet the increasing demand. August is expected to show the same demand as July so that the stocks at the end of August, 1918, will probably be between 6,000,000 and 7,000,000 bbls. September will witness the culmination of that period of greatest consumption and close the heavy drafts on stocks unless exports increase at a greater rate than is now expected.

"In normal times," continues the report, "such a discrepancy between production and consumption during the summer months would cause no undue consternation for sufficient gasoline would be stored during the winter months to more than overbalance the heavy summer demand. At present, however, conditions are abnormal and it is difficult to forecast the future. The domestic demand for gasoline during the coming winter will probably be reduced by a falling off in automobile production and the necessity for economy among the people. On the other hand our war demand for gasoline both at home and abroad will probably be tremendous, especially with the advent of spring, so that the situation is really serious but not so much because of present shortage as because of the forthcoming shortage of next year.

"We are not now producing enough crude oil to supply refineries, gasoline stocks have been reduced to a two weeks' or three weeks' supply, and although the present situation has been well taken care of by the Fuel Administration we are facing a tremendous demand next spring and a demand as inflexible as it is great for we must have adequate supplies of gasoline for our own overseas forces and for those of our Allies. The need for conservation is apparent and the American people should voluntarily forego the pleasure of needless automobile touring during these times. Such voluntary conservation may now prevent the necessity of more serious action later. Furthermore, every step should be taken by the people and their representatives not only to conserve our present supply of gasoline but also if possible to increase our future supply and the supply of crude oil from which gasoline is made."

—

Licenses for Experimental Flights to Be Submitted to Army and Navy

WASHINGTON, Sept. 21—Applications for flying licenses to conduct experimental flights must hereafter be submitted to the proper Army and Naval authorities before being filed with the Joint Army and Navy Board on Aeronautic Cognizance, Building D, Sixth and B Streets, Washington, D. C.

Applications should be made either by individuals or airplane companies making new types of navy airplanes to Captain N. E. Irwin, U. S. N., Director Naval Aviation Division, New Navy Building, Washington, D. C., and for flying army aircraft to the Technical Section, Division of Military Aeronautics, Dayton.

Gasoline Stock Down 68,531,749 Gal.

July's Production Figures Satisfactory, But Stock Low at End of Month

Production	July, 1918	June, 1918
Crude oil (bbl.)	29,170,718	28,140,479
Gasoline (gal.)	332,022,095	315,023,445

Stocks on Hand	July 31, 1918	June 30, 1918
Crude oil (bbl.)	14,026,525	11,956,151
Oils purchased to be re-run (bbl.)	1,548,971	932,561
Gasoline (gal.)	349,928,604	418,440,353
Kerosene (gal.)	432,807,129	426,285,676
Gas and fuel (gal.)	519,012,839	550,704,759
Lube. gal.)	136,460,207	158,316,257
Wax (lb.)	176,539,564	169,424,428
Coke (ton)	17,943	17,148
Asphalt (ton)	92,597	97,631
Miscellaneous (gal.)	450,086,589	273,877,024

WASHINGTON, Sept. 23 — During July, 1918, the daily production of gasoline was 10,710,390 gal. against a daily average for the previous month of 10,500,781 gal. The improvement is slightly better than indicated by the figures as July had 31 days compared with 30 in June.

The stock of gasoline on hand at the end of July shows a decrease of 68,531,749 gal. when compared with the end of June stock and is no less than 110,708,875 gal. below the stock at the end of May. Obviously some reduction is expected during the summer months, and doubtless the temporary stoppage of the use of passenger cars on Sundays will help to bring back the stock figures to normal.

The crude oil position is slightly better, both as regards production and stock,

Production and Consumption of Gasoline

Increase in crude oil consumption by refineries:		
Daily average 1917	863,374	bbl.
Daily average first 7 months 1918	874,964	bbl.
Increase	11,590	bbl.
Daily average increase for July, 1918	940,991	bbl.
Increase over July, 1917	77,617	bbl.

The following tabulation shows the changes in stocks of the principal refined products except gasoline from Jan. 1, 1918, to Aug. 1, 1918:

Kerosene	127,744	bbl. decrease
Gas and fuel oils	737,882	bbl. decrease
Lubricating oils	171,878	bbl. decrease
Paraffine wax	21,790,190	lb. increase

The following tabulations show the approximate production, consumption and stocks of gasoline for the first 8 months of 1918:

Months	(b) Production, Bbl.	(c) Stocks at End of Month, Bbl.		(d) Decrease or Increase for Month, Bbl.		(e) Average Daily Increase or Decrease in Stocks, Bbl.	(f) Total Consumption, Including Exports
December, 1917	.....	9,815,000					
January, 1918	5,580,000	11,160,000	+	1,345,000	+	43,400	4,235,000
February	5,370,000	12,350,000	+	1,190,000	+	42,500	4,180,000
March	6,410,000	12,550,000	+	200,000	+	6,450	6,210,000
April	6,990,000	12,120,000	—	430,000	—	14,300	7,420,000
May	7,600,000	10,950,000	—	1,020,000	—	32,900	8,620,000
June	7,900,000	9,960,000	—	990,000	—	33,000	8,490,000
July	7,900,000	8,330,000	—	1,630,000	—	52,600	9,530,000
August	8,000,000	6,830,000	—	1,500,000	—	48,400	9,500,000

The month of August, as shown in the above figures, was an estimate as the figures from the refineries are not yet available.

Column (d) shows an excess of production over consumption or in other words amounts that had to be taken from storage to meet the demand.

Column (e) shows that during July the average daily gasoline shortage was 52,600 bbl.

and there is a substantial improvement in the item of re-run oil. This is given separately for the reason that it represents crude or distillate which has been included in the regular crude oil production figures at some prior date.

Owing to the abnormal demands of the naval and merchant marine, the largest item in the stock list is that covering fuel oil. During July the average daily production of this was no less than 21,239,990 gal.—nearly double that of gasoline.

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Packard Has Graduated 1259 Women

DETROIT, Sept. 20—The Packard Motor Car Co. has graduated 1259 women and girls from its training school which was established last spring. Approximately two-thirds of the Packard women employees, of which there are more than 1000, were trained in this school. The present school enrollment is 250.

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Powell Buys Omaha Auto Supply

OMAHA, Sept. 23—The Powell Supply Co., of which the president is Clark G. Powell, has purchased the entire stock of the Omaha Auto Supply Co., a concern which has been in existence for seven years. The stock is said to be worth $50,000. Part of the Omaha organization goes with Powell, including Manager Wilson.

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Canada Wants Gasoline Cards

MONTREAL, Sept. 23—The Montreal Automobile Association, through Secretary Thomas C. Kirby, has petitioned the authorities at Ottawa for the issuance of gasoline cards to our owners instead of the establishment of regultions which forbid the use of cars on Sunday.

Gasoline Men to Be Licensed

Oil and Gasoline Makers and Dealers Having Business Over $100,000 Affected

WASHINGTON, Sept. 21—Importers, manufacturers, distributers and transporters of crude oil, fuel oil, gas oil, kerosene or gasoline whose annual businesses exceeds $100,000 will be required to operate under a license on and after Oct. 1, 1918, according to a proclamation issued to-day by President Wilson.

The licenses can be secured from the United States Fuel Administration, Oil Division, Washington, D. C. Special blank forms will be provided by the Fuel Administration for that purpose. Holders of existing licenses already issued by the United States Fuel Administration are not required to secure new licenses.

The proclamation issued by the President is under the authority of the Congressional Act, "to provide further for the national defense by encouraging the production, conserving the supply, and control the distribution of food products and fuel," which was approved by the President, Aug. 10, 1917.

Any individual, firm, corporation or association which continues to carry on a business or importing, manufacturing or trading in crude oil or its products or natural gas, and whose business exceeds $100,000 yearly, will be liable to penalties prescribed by this act.

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Employers Should Help Draft Boards

WASHINGTON, Sept. 21—Employers are called upon by the Provost Marshal General of the War Department to assist the Local Boards and District Boards in making decisions on industrial exemptions under the new draft. In the first draft of 1917 out of more than 3,000,000 registrants called only 140,000 filed occupational claims or 4.7 per cent. Ninety-five per cent of all registrants raised no question of such deferment. Under the next draft it is expected that conditions will be considerably reversed, and that numerous occupational claims will be made.

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New Army Purchasing Department Appointments

WASHINGTON, Sept. 20—Under the reorganization of the General Staff, Brigadier General Hugh S. Johnson and Gerard Swope have been appointed assistants to Major General George W. Goethals, Director of Purchase, Storage and Traffic.

The Quartermaster General of the Army is made Director of Purchase and Storage and will be responsible for and have authority over storage, distribution and issue within the United States of all supplies for the Army. Colonel William H. Rose of the Corps of Engineers is designated to act under him as Director of Purchase, while Colonel F. B. Wells will act as Director of Storage, with L. M. Bicolson as his assistant.

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Skilled Men Wanted for War Department

WASHINGTON, Sept. 19—Manufacturers and business men have been requested to co-operate with the General Staff of the War Department to aid in securing skilled office men for War Department work. There is a pressing need for men who have demonstrated their qualifications and ability in statistical work, factory production, accountancy, purchasing, merchandising and warehousing.

Total Output of Refineries in the United States for 1917

1917	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
January	24,839,772		203,618,724	137,248,370	469,596,208	60,941,062	39,558,627	44,627	49,894	27,331,019	941,924
February	23,083,433	no account	184,602,595	129,074,504	446,964,925	54,631,765	36,370,297	42,047	40,619	23,685,686	941,110
March	26,230,138	1st 6 mo.	220,523,571	159,028,978	494,855,838	64,345,221	40,868,930	48,839	52,823	26,977,334	870,380
April	25,994,938	1917	228,945,164	157,826,945	462,846,339	63,218,215	41,037,511	46,099	52,849	30,959,901	957,533
May	27,253,391		238,816,209	147,894,846	504,859,695	65,926,007	38,686,364	43,535	67,612	31,086,377	979,245
June	26,453,210		233,671,746	151,477,333	496,742,434	61,045,757	38,075,280	42,513	67,931	30,205,172	1,011,568
July	26,776,856	2,435,533	244,145,292	161,679,053	599,454,966	64,335,905	40,158,033	42,641	65,272	92,359,401	1,111,511
Total first seven months	180,631,738	———	554,323,301	1,034,230,029	3,475,320,405	434,443,932	274,755,042	310,301	397,000	262,604,890	6 813,271
August	27,900,623	2,376,580	254,464,491	149,528,513	632,151,971	64,107,817	38,999,341	46,240	73,878	92,708,312	1,286,141
September	27,529,022	2,632,988	256,132,050	143,203,644	629,914,572	60,757,049	48,200,033	42,986	62,520	80,386,471	1,182,560
October	27,698,023	2,863,518	271,891,234	140,559,542	621,492,374	68,516,071	41,181,400	48,849	73,886	91,804,160	1,355,219
November	26,215,979	2,519,700	264,888,709	125,893,202	592,490,037	64,861,375	39,694,595	45,815	73,289	87,115,002	1,203,110
December	25,155,996	2,069,351	248,846,638	123,354,046	561,954,921	61,090,596	38,269,670	45,175	58,852	87,548,408	1,233,528
Total	315,131,681	14,897,670	2,850,546,423	1,726,768,976	6,513,324,280	753,776,840	481,200,081	539,366	739,425	702,167,243	13,073,829

Total Output of Refineries in U. S. for First Seven Months of 1918

1918											
January	23,842,587	2,300,334	242,632,044	119,358,184	547,866,248	56,625,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,619	121,218,320	510,165,397	58,300,914	35,087,337	42,371	42,033	75,134,088	983,992
March	26,239,662	3,696,872	269,647,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,396,162	153,703,682	578,255,341	71,022,204	40,173,524	45,674	51,242	89,242,012	1,182,020
May	28,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,755	42,544,633	48,864	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,282,177
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,303,107	41,691,551	48,914	58,433	159,374,139	1,338,304
Total	185,492,364	25,798,613	2,006,417,535	1,014,768,031	4,143,140,714	488,568,732	283,650,716	317,892	374,233	659,349,629	8,231,444

British Organize Industrial Research

Four Industries Now Have Associations, and Thirty More Will Soon

LONDON, Sept. 10—The establishment of research associations is rapidly increasing among British industries. Four industries have already established such associations and 30 more are now preparing to do so, according to the third annual report of the British Research Department, which was organized recently by the Government for the purpose of encouraging research and assisting the scientific investigation of industrial problems.

The industries which now have their research associations are the photographic, scientific instrument making, Portland cement and woolen and worsted industries. There is abundant evidence that the movement is to receive the unqualified support of all industries, as the need for organized research in connection with industries is being increasingly realized. The supply of research workers, however, may cause a serious setback if it cannot be expanded rapidly to meet increasing demands.

The formation of an industrial fatigue research board, which was accomplished with the help of the medical research committee, is one of the most interesting developments of the past year. The function of this board is to consider and investigate the relation of the hours of labor to other working conditions, and their effect on production.

Privy Council's Policy

The report of the research department was preceded by a supplementary report of the committee of the Privy Council for Scientific and Industrial Research. In this supplementary report the Privy Council stated its policy and said:

"The department has found in the course of its conversations with leading manufacturers that there is sometimes a certain hesitancy to establish relationship with the Government for the purpose of research because of fear that the department will interfere in the work of the new association, and will use its powers in such a way as to prevent the results of research from reaching the firms which have subscribed to its cost, or to give the results to competing firms which have not joined or have left the association."

The council points out that such a result would be fatal to the success of the scheme, and that it is the intention to permit the associations to manage their own affairs, and benefit by their own discoveries. It is thought that the departments can help each association by keeping it in touch with all work.

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War Service Committee for M. A. M. A.

NEW YORK, Sept. 23—At a meeting of the Motor and Accessory Manufacturers' Association Friday it was voted that President C. W. Stiger appoint a War Service Committee, and that this committee request the War Industries Board for a hearing on the affairs of the parts makers.

The parts makers were included in the industrial committee which operated in Washington at the beginning of the war, but since the committee was reorganized some time ago have not had an official representation for contact with governmental agencies.

The association is sending to members and other parts and equipment makers a statement as to the detail of how the automobile and truck industries are being handled by the War Industries Board, including priority plans and other matters.

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Trucks Hold Destiny of Industry

(*Continued from page* 555)

one per cent as much freight being moved by motor express now as the railroads are carrying. High development of the return-loads bureau, which insures most economical operation of highways transport, was noted in the State of Connecticut, with Hartford acting as the central bureau. In Cincinnati and Omaha, livestock are being carried to stockyards over the highways in increasing numbers. Rural express has reached its highest efficiency in Maryland, New Jersey, eastern Pennsylvania and southern New York. Arrangements have been made to connect New York State Barge canal ports with the farming communities back from it by rural express.

Edward Chambers, former vice-president of the Santa Fe Railroad, now Director of Traffic in the National Railroad Administration, urged the chairmen to promote the trucking of less-than-carload shipments from the manufacturing centers to communities thirty and forty miles out, and the co-operation of the highways regional chairmen with the railways regional traffic directors, to facilitate the clearing of the terminals in the larger cities. Mr. Chambers announced that in conjunction with the Highways Transport Committee, the Railroad Administration is trying out the store-door delivery system in New York, with hopeful results. If it meets expectations there, it will be extended to other large centers.

The Highways Transport Committee is completing countrywide organization that will number more than 15,000 committeemen, manufacturers, farmers and consumers, all working through contact with the State Councils of Defense and with the committee's regional chairmen.

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Ford Transfers Labor for Ships

DETROIT, Sept. 23—More than 3000 laborers from the Ford Motor Co.'s plant have been transferred to the Ford shipbuilding plant to work on Eagles within the past 3 months. Between fifteen and thirty men are leaving the plant daily to take their places in the ranks of the army or navy. Nearly 6000 employees have left the factory for national service during the last year.

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Franklin to Make Hispano-Suiza Parts

SYRACUSE, Sept. 22—The H. H. Franklin Mfg. Co. has received a contract from the Wright-Martin Aircraft Corp. for parts of Hispano-Suiza engines.

8 Hour Day Adopted by Steel Corp.

More Than 275,000 Workers Affected—Midvale Co. Announces Co-operative Plan

NEW YORK, Sept. 24—The eight-hour day has been adopted by the United States Steel Corporation as a basis for calculating wages and working periods for its employees. The new plan will go into effect on Oct. 1. Something more than 275,000 workers in rolling mills, blast furnaces, mines and transportation organizations affiliated with the corporation and operated by it will be affected.

Elbert H. Gary, Chairman of the Board, made the following announcement after a meeting of the directors to-day:

The Finance Committee of the United States Steel Corporation to-day unanimously approved the recommendation of the Chairman and President of the corporation and of the Presidents of the subsidiary companies to adopt the eight-hour basic day, to become effective Oct. 1, 1918. The open-shop plan heretofore in force throughout the works will be continued.

An Increase of 42 Cents

It is believed, following the lead of the largest unit in the industry, other steel manufacturing concerns will shortly announce the adoption of the eight-hour day.

A day laborer working ten hours under the new schedule will get $3.36 for eight hours and an additional $1.26 for the two remaining hours, or $4.62 all told as against $4.20 at present.

The increase of 42 cents over the present pay for ten hours is equal to 10 per cent. Applied to the balance available for dividends, the experts calculate that at the current rate of earnings and under the expected Federal taxes, the increase of wages will cause a reduction in the balance of not more than 2 per cent.

Midvale Adopts Labor Co-operation

The Midvale Steel & Ordnance Co. has invited its employees to co-operate with the officials of the company for the purpose of working out plans for mutual benefit. A committee of employees of the Midvale Co. and the Cambria Steel Co., a subsidiary concern, will meet with a committee consisting of vice-presidents of the Midvale Co. in Philadelphia to arrange details of the plan.

On Monday morning notices were posted throughout the plant of the Midvale Co., signed by President A. C. Dinkey, which read as follows:

We recognize the right of wage earners to bargain collectively with their employers, and we hereby invite all employees to meet with the officers of their respective companies for the purpose of considering and, if practicable, adopting a plan of representation by the employees, which shall be thoroughly democratic and entirely free from interference by the companies, or any official or agent thereof. It is hoped that every employee will respond to this invitation and meet with the officers of the company in the spirit of fair dealing and mutual helpfulness.

Iron and Steel Price Unchanged

President Approves Agreement Maintaining Present Figures with Few Exceptions

WASHINGTON, Sept. 24—The President has approved the agreement made by the Price-Fixing Committee of the War Industries Board with representatives of the iron ore, pig iron and steel interests, and the maximum prices now prevailing on these products will be continued in effect for the three months ending Dec. 31, 1918, with the following exceptions:

Lake Superior iron ore base prices delivered to the lower lake ports are increased 25 cents per gross ton, effective Oct. 1, subject to increase or decrease in event that rail or lake rates increase or decrease.

Basic iron base prices have increased to $33, f.o.b. furnace. The base price on No. 2 foundry iron is increased to $34, f.o.b. furnace. Standard Bessemer iron is fixed at $35.20, f.o.b. furnace. These prices are subject to the following changes from previous practice as regards delivery:

(a) Pig iron produced in the Virginia, Tennessee, and Birmingham districts and the scattering districts south of the Ohio and Potomac Rivers, including furnaces at St. Louis, Mo., but not including furnaces bordering on the Ohio River, shall be sold on a f.o b. Birmingham, Ala., basis.

(b) Pig iron produced in the Eastern district, i.e., from all blast furnaces located east of the Allegheny Mountains and north of the Potomac River, shall be sold on a f.o.b. Pittsburgh basis.

(c) Pig iron from all other producing districts or furnaces shall be sold f.o.b. furnace as heretofore.

No new contracts calling for delivery of any of the above commodities or articles on or after Jan. 1, 1919, are to specify a price unless coupled with a clause making the price subject to revision by any authorized United States Government agency, so that all deliveries after that date shall not exceed the maximum price then in force, although ordered or contracted for in the meantime. It is expected that all manufacturers and producers will observe the maximmum prices now fixed.

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Form Marine War Service Committee

WASHINGTON, Sept. 25—W. H. Manss, Director of the War Service Executive Committee of the United States Chamber of Commerce has called a meeting of manufacturers of marine internal combustion engines and accessories, to be held on Sept. 27 at 2 p. m. A War Service Committee of the trade is to be formed.

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N. A. C. C. Meeting Oct. 3

NEW YORK, Sept. 25—Hugh Chalmers, vice-president of the N. A. C. C., will report on the Washington situation as it affects the automobile industry at the regular monthly meeting of the N. A. C. C., which is to be held at the general offices in New York on Thursday, Oct. 3.

C. C. Hanch, chief of the Automotive Products Section of the War Industries Board, will answer questions relating to priorities, materials, etc. A meeting of the motor truck manufacturers will be held at 2 p. m. George M. Graham, chairman of the National Motor Truck Committee, will speak on "How the Motor Truck Industry Is Affected by Developments in Washington," and will cover such questions as priorities, materials, preference list, classification of employees in the draft, and the best methods of retaining essential men without interfering with the war program.

Other matters to be considered at this meeting are: "Taxes Levied Against Motor Trucks in the New Revenue Bill," "War Orders for Trucks," "Rural Motor Express," "Need for Uniform Laws," "Action on Plan to Standardize Truck Tires," "Work of Highways Transport," and "Increasing Need for Improved Highways to Increase Motor Truck Haulage."

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Range of Travel Governing Factor in Airplane Future

DETROIT, Sept. 21—Range of travel is the greatest problem which must be solved in determining the future of the airplane industry, according to C. F. Kettering, president of Delco and the S. A. E. President Kettering's address was given on the occasion of the first Detroit Section meeting for the year, held at the Hotel Pontchartrain last night.

The topic, "The Future of the Airplane Industry After the War," was of popular interest in this section, as shown by an attendance of 600 local S. A. E. members and their friends. Mr. Kettering largely repeated the address he gave before the Cleveland Section.

A committee was appointed to co-operate with the legislative body in Lansing to frame suitable laws covering headlight glare. This committee was appointed at the request of Governor Sleeper of Michigan, and consists of the following:

W. E. Metzger, president Detroit Automobile Club; Charles E. Godley, engineer of Edmunds & Jones; J. B. Replogle, engineer of the Remy Electric Laboratory; H. J. Platts, engineer of the C. M. Hall Lamp Co.; F. E. Watts, chief engineer of Hupp Motor Car Co.; and J. E. Schipper, chairman Detroit Section, S. A. E., ex-officio member.

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Russel on War Credits Board

WASHINGTON, Sept. 25—Albert W. Russel, formerly president of the Russel Motor Axle Co. and treasurer of the Russel Wheel & Foundry Co. of Detroit, has been appointed a member of the War Credits Board by the Acting Secretary of War, Benedict Crowell, to fill a vacancy caused by the resignation of F. P. Neal.

Essential Truck Use Defined

N. A. C. C. Issues List of Industries That May Purchase Vehicles

WASHINGTON, Sept. 23—A list of essential truck users has been compiled by the truck committee of the National Automobile Chamber of Commerce, to be used by makers, distributers and dealers as a guide in the sale of motor trucks.

The list has been approved by the War Industries Board. Motor trucks may be sold to any user included in the lists. They cannot be sold to anyone not engaged in the trades or industries listed without special permit from the War Industries Board.

Truck manufacturers have already filed their pledges to observe these regulations and have exacted similar pledges from their distributers and dealers. Consequently, hereafter the only necessary procedure in making truck sales is to make certain that the prospective buyer is one of the essentials as named by the lists. If his trade or industry is so named no further formality is necessary and the sale can be made. The industries and trades that are essential, besides those named in the War Board's preferential list, are:

Seeds
Refrigeration.
Bridge builders.
Contractors, building, road, paving, sand, gravel, cement, bridge steel and garbage.
Farm wagon manufacturers.
Public haulage companies.
Drayage concerns.
Transfer companies.
Casket makers.
Cemeteries.
Department stores.
Elevator makers.
Hardware manufacturers.
Heating and ventilating concerns.
Hotels.
Hotel supply manufacturers.
Linoleum manufacturers.
Plumbers' supplies manufacturers.
Stove manufacturers.
Tent and awning manufacturers.
Tire makers.
Typewriter manufacturers.
Warehouses.

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Foreign Missions Members Requested to Return Home

WASHINGTON, D. C., Sept. 26—Members of the foreign military missions, British, French and Italian, who are acting in an advisory capacity to the American army in this country, have been requested by the War Department to return to their own country as soon as convenient and not later than Nov. 1. Only those who are very necessary will be retained temporarily. This request which came in the form of an order from the War Department, created surprise and some feeling on the part of the foreign experts who were aiding our army on such matters as aviation, ordnance, motorized vehicles, etc. The various missions when landing in this country reported to their ambassadors and are surprised because they were not notified that their services were no longer required through the same source.

To Develop New Oil Lands

Millions of Acres of Federal Territory May Be Available If Bill Passes

WASHINGTON, Sept. 20—There are 6,524,834 acres of land either known to contain oil and gas or believed to contain them, which would be valuable for exploration and development if Senate Bill 2812 is enacted, according to Van H. Manning, Director of Mines. Mr. Manning filed this statement together with other data with the Senate in answer to a resolution requesting his opinion if passing of this bill would alleviate the so-called gasoline shortage. This bill, as told in a previous issue of AUTOMOTIVE INDUSTRIES, will allow the Secretary of Interior to grant individuals the right to prospect for oil or gas on Government land.

Director Manning stated in his letter that the enactment of this law will allow for development of vast areas of land in this country, and undoubtedly result in the discovery and development of new oil fields and deposits, will permit the leasing of new land actually proved to contain valuable deposits of oil, permit the further development of existing claims in withdrawn areas which have on them one or more producing wells, and which are equipped with pipe lines and facilities for transportation of oil. He recommends the passing of the bill as highly desirable and believes it will prove an important war measure. Following is Director Manning's letter and that portion of Senate Bill No. 2812 relating directly to the oil and gas land developments:

Sir: In connection with resolution passed by the Senate asking whether the enactment of S. 2812 would help the oil situation, the following is submitted:

Prior to September 27, 1909, public lands in the United States and the Territory of Alaska were subject to exploration, location and purchase under the placer-mining laws of the United States (secs. 2329-2331, R. S., Acts of Feb. 11, 1897, 29 Stat., 536, and Feb. 12, 1903, 32 Stat., 825). Under these laws any citizen of the United States or person who had declared his intention to become such, could go upon the public lands and explore for oil, and upon discovery apply for and receive patent as prescribed in the mining laws. September 27, 1909, the President of the United States withdrew from exploration, location and entry large areas of public lands known or believed to contain valuable deposits of petroleum for the primary purpose of withholding same until Congress could consider legislation designed to secure the exploration for and development of deposits of oil and gas under a leasing law. Similar withdrawals had been made from time to time until at the present there are withdrawn from all exploration, location and entry 6,524,834 acres of land either known to contain oil and gas or believed to possess possibilities thereof. This acreage is not all public lands, as considerable areas within the exterior limits of withdrawals were patented under the various public-land laws prior to dates of withdrawal. There are also withdrawn 132,024 acres of land known to contain valuable deposits of oil shale. The withdrawals cover lands in the States of Arizona, California, Colorado, Louisiana, Montana, North Dakota, Utah and Wyoming. In addition all lands containing deposits of oil in the Territory of Alaska are likewise withdrawn.

Most of the lands so withdrawn are free from claims and would, if S. 2812 or other legislation providing for their disposition were enacted into law, be subject to exploration and development in accordance with its provisions. A minor portion of the area, comprising valuable proved oil territory was, however, covered by locations made under the mining law prior to withdrawal and the claims so asserted have not been disposed of, but are pending in the Land Department or in the courts. Most of these claims have upon them one or more producing oil wells, but increased production through the drilling of additional wells is practically halted by the withdrawal. The so-called relief provisions of S. 2812 are designed to adjust these controversies and secure the development of the lands.

In my opinion the enactment of a law providing for the development of the oil lands of the United States would (1) open to exploration and development the vast areas of public land in the United States and Alaska now absolutely withdrawn from exploration and development, thereby resulting in the discovery and development of new oil fields and deposits, thus adding to the oil and gas supply of the United States and Alaska; (2) permit of the leasing of lands now withdrawn and actually proved to contain valuable deposits of oil and gas by the existing wells upon the lands or upon adjoining tracts; these fields are principally located in California, Wyoming, Montana and Louisiana; and (3) permit of the further development of existing claims within withdrawn areas which have upon them one or more producing oil wells. These areas are already equipped with pipe lines and facilities for developing and transporting oil, and many of the interested individuals and corporations have equipment in the way of casing and other supplies which could be immediately utilized in the drilling of additional wells.

The most immediate results would be obtained from the lands mentioned in the above items 2 and 3, namely, proved lands which have not been developed by oil wells and lands within withdrawals but which have within their limits one or more producing oil wells at the present time.

During the past few years I have made a number of reports and suggestions to the Public Land Committees of Congress with respect to legislation of the character involved, and bills have passed one of the bodies of Congress, but none has received concurrent approval. I do not feel that I should at this time specifically indorse any particular measure, and consequently this report is designed to explain briefly why I believe the enactment of legislation for the development of the oil resources of the public domain would materially aid in obtaining an increased fuel supply in the immediate future. It must be obvious to anyone familiar with the situation that the existing withdrawals and controversies prevent the bringing of the oil from underground and into use, and the conditions described in the report of the United States Fuel Administrator in his report to the Senate, dated Sept. 10, 1918, document 277, and in my report responding to Senate resolution 301, which gave in some detail the present situation with special reference to gasoline, emphasize the importance and desirability of the enactment of legislation which will, while properly preserving the public interest, stimulate and encourage the production of oil from our public lands.

I am of the opinion, therefore, that viewed from any angle the passage of a leasing bill is desirable, and conditions possibly will arise that will make it distinctly a war measure. Respectfully,

VAN H. MANNING, Director.

War Board Controls Pig Tin

Users and Dealers to Be Licensed and Inventories to Be Made

WASHINGTON, Sept. 20—Control of domestic pig tin under a license system has been assumed by the War Industries Board. All users and dealers in pig tin will be licensed and a complete inventory of stocks on hand and unfilled contracts will be made and, if necessary, supplies will be redistributed to equalize them, according to essential uses. Full details of the licensing plan will be announced later. More than 2000 questionnaires have been sent to individuals and plants asking for information as regards the stocks of pig tin on hand and the unfilled contracts.

This action by the War Industries Board was forecast when announcement was made by B. M. Baruch, chairman of the board, that an inter-Allied pig tin pool had been arranged in conferences held in London between the L. L. Summers Commission, representing the War Industries Board, and representatives of Great Britain and other Allied nations.

Under this pool, which is in the nature of a beneficent monopoly, the world's supply of pig tin is allocated and distribution is made among the Allied countries according to the supply and their needs. The United States will get about 80,000 tons of pig tin, or approximately two-thirds of the world production.

The War Industries Board will supervise the allowance to this country. All imports of pig tin, tin ores and concentrates will be consigned to the American Iron and Steel Institute, and will be distributed to the licensees through the United States Steel Products Company. Prices will be regulated by the War Industries Board, and will be uniform and at a level that will encourage production in the tin mining countries, which are chiefly Great Britain and the Straits Settlements.

Shipments to Denmark Allowed

WASHINGTON, Sept. 20—The War Trade Board has concluded an agreement with a special Danish mission, allowing for the following annual quantities of supplies (in metric tons) for shipments to Denmark. The following list contains only those commodities which are of interest to the automotive industries:

Kerosene, gasoline, lubricating oils, and greases, crude petroleum and dark refuses, including not over 7000 tons lubricating oils	80,000
Copper and manufactures of (including brass)	3,500
Brass wire	34
Brass wire screens for paper making	20
Brass screws	36
Iron and steel products, including shipbuilding material (shipbuilding material to be subject to special agreement)	150,000
Electric lamps	70
Nickel and manufactures	14
Aluminum and manufactures	132
Lead and manufactures	3,000
Tin and tin plate. Quantity to be later agreed	
Zinc sheets	300
Zinc and manufactures	2,700
Silver and manufactures	14

In addition various instruments for technical, scientific and nautical purposes (if approved), motors, automobiles and parts (excluding tires), electrical machinery, bicycles and bicycle parts (excluding tires), typewriters, accounting machines, office equipment, supplies, sundry machinery and parts (if approved) hand tools of various kinds, hardware, in quantities in accordance with actual Danish requirements for home consumption.

Crude rubber	130
Bicycles tires	100
Motor and motorcycle covers and tubes	250

Patent Granted to Chevrolet Men

FLINT, MICH., Sept. 21—A patent has been granted Arthur C. Mason and T. Sturt, assignors to the Chevrolet Motor Co., on an automobile engine.

War Board Controls Ocean Shipments

Will Issue Both Import Licenses and Import License Numbers

WASHINGTON, Sept. 19—Changes in import ruling governing the certification of invoices for shipments by the American consular officers have been made by the War Trade Board. American consular officers will certify no invoices for ocean shipments to be made on or after Oct. 1, 1918, to the United States except on receipt of official notification from the War Trade Board of the issuance of an import license and import license number. After Oct. 1 consular officers are not permitted to accept import license numbers furnished by shippers as heretofore.

The number of any such import license, together with all necessary information, will, at the request and cost of the applicant for import license, be cabled or mailed by the War Trade Board to the Consular Officer whose consular district is designated by the applicant as the district from which the shipment to the United States will be made.

New forms of application for import licenses will soon be available, which will contain a blank to be filled out by the applicant for the purpose of indicating whether the applicant desires official notification of the issuance of the import license and of the number thereof to be sent by cablegram or by mail. The applicant designates in such blank the appropriate American Consular Officer. If the applicant is not able to supply the information at the time of the filing of his application, he should do so as soon thereafter as possible, either before or after the issuance of the license. All requests for such official notification made after the filing of the application should be, whether mailed or telegraphed, addressed as follows:

"Bureau of Imports,
War Trade Board,
Washington, D. C."

Such request should refer to the application or license number and should designate the appropriate Consular officer.

Import licenses will continue to be issued valid for a period of 90 days, but, under the new regulations, import licenses issued on or after October 1, 1918, will be valid if ocean shipments thereunder are made within 90 days from the date of such license. It will no longer be necessary, as in the case of licenses issued prior to October 1, 1918, that entry into the United States be made within the 90 days. This change will be of benefit to shippers and importers, who, heretofore, in many cases, have found it difficult to prepare merchandise for shipment, arrange for freight space, and obtain entry into the United States within 90 days.

With respect to import licenses which are outstanding and unused on October 1, 1918, if the shipments covered by such licenses have not been consulated by that date and the ocean shipments thereunder will be made on or after October 1, 1918, it will be necessary that official instructions be cabled to the appropriate Consulate officer at once by the War Trade Board. That there may be no delay in such shipments, the holders of such outstanding licenses should immediately notify the War Trade Board that they desire the appropriate American Consular officers to be officially notified by the War Trade Board, either by cablegram or letter, of the issuance of such outstanding licenses and of their numbers.

The date of ocean shipment, for purposes of these regulations, will be the date of a through ocean bill of lading to the United States.

Inasmuch as Consular officers will be governed, when consulating invoices, by the dates of the licenses and the dates of the through ocean bills of lading, importers are cautioned to keep accurate record of the expiration of dates of licenses in order that they make certain that the through ocean bills of lading are issued to them within the 90-day period, or, in the event that such through ocean bills of lading are not issued within such period, that they may apply in due time for extensions or new licenses, thus avoiding delays and possible loss. Applications for extensions of expired licenses and for reissuances may be filed and will be disposed of according to the circumstances of each case.

It will be possible, as heretofore, to make partial shipments against a license, provided such shipments are made during the life of the license. All such partial shipments will be governed by the same rules as those that govern complete shipments.

Invoices for shipments of commodities covered by general import licenses known as "PBF" licenses will continue to be certified by Consular officers under the general license numbers, without official instructions governing each individual shipment (except that shipments covered by a general license "PBF" No. 1 require no certified invoices).

Following is a list including a number of the outstanding general or "PBF" import licenses:

PBF No. 12. Covering the importation of all commodities of the origin or destination specified below which arrive at any port of the United States or which are conveyed in transit through the territory of the United States either in bond or otherwise, as follows:

(a) Commodities originating in Canada or Newfoundland and destined for any country in the world; or originating in Great Britain, France or Italy or any of their European or West Indian possessions and destined for Canada or Newfoundland.

(b) Commodities originating in Great Britain, France or Italy and destined for any West Indian colony, possession or protectorate of said countries, or originating in any of said West Indian colonies, possessions or protectorates and destined for Great Britain, France or Italy, except (e) below.

(c) Commodities originating in Canada or Mexico and destined for another point in the same country, passing through the United States en route, except (e) below.

(d) Commodities of whatever origin or destination not now or hereafter placed on the restricted list, except (e) below.

(e) Shipments under paragraphs (b), (c) and (d) are not to be included in the general license when such shipment would cross the United States from an Atlantic to a Pacific or Gulf port, or from a Pacific to an Atlantic or Gulf port, or from a Gulf to an Atlantic or Pacific port.

PBF. No. 14. Covering the importation of iron ore from Sweden and Spain when coming as ballast in vessels returning from these countries.

PBG No. 18. Covering the importation when shipped from Yarmouth, Nova Scotia, to Boston, Massachusetts, by vessel approved by the War Trade Board, of all commodities the importation of which is permitted without individual license overland or by the Great Lakes from Canada.

PBF No. 25. Covering the importation of all commodities arriving at United States ports in bond in transit to Canada, provided the Canadian import license covering the shipments or proper proof of the issuance of such license is presented to the Collector of Customs. (This supersedes PBF-12 as to in bond transit shipments to Canada.)

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Platinum Used Extensively for War Purposes

WASHINGTON, Sept. 19 — Congressional discussion about the use of platinum yesterday developed that it is one of the very important commodities used in the war. The Signal Corps uses 500 ounces yearly for telephone, telegraph and radio work. The greatest use of platinum however, is in the manufacture of explosives, in the production of trinitrotoluol, gun cotton, dynamite and picric acid, which latter in turn is made with the use of nitric acid. Nitric acid is manufactured with the aid of sulphuric acid. Sulphuric acid is manufactured through two processes: Contact process and chamber process. Contact process is most frequently used and this requires platinum. A plant producing 20 tons of sulphuric acid in a day will require 350 or 400 ounces of platinum yearly. It is estimated that when our synthetic nitrate plants are completed they will need 20,000 ounces of platinum yearly.

Use of Highways Advocated

Fuel Administration Endorses Intensive Employment of Roads

WASHINGTON, Sept. 20—The United States Fuel Administration has endorsed the most extensive and efficient use possible of the highways in a letter to the Highways Transport Committee emphasizing the importance of the committee's program in connection with movement of coal from wagon mines. This letter from Cyrus Garnsey, Jr., Assistant Fuel Administrator, stated:

"We are also convinced that transportation resources can be greatly increased and larger tonnage movement of coal from wagon mines direct to consumers effected by applying all possible vehicles, horses and the necessary labor in line with national policies promulgated by you, and operating over suitable highways constantly maintained in efficient condition.

"For this reason we ask that you convey to our field organization our very real interest in this part of their work and assure them we desire to support their organization to the limit in their efforts to effect greater tonnage movement of coal over the highways from wagon mines to consumer.

"We suggest also that whenever conditions of roads, local legislation, lack of suitable equipment, and so forth, tend to impede the most effective and efficient movements, you will promptly bring these matters to our attention.

"To expedite the handling of these questions the Fuel Administration has committeed them to its Mine Track Committee, composed of Frank G. Jones, chairman; Robert L. Ireland and S. A. Taylor."

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McGraw Advances Some Prices

EAST PALESTINE, OHIO, Sept. 22—The McGraw Tire & Rubber Co. has made a slight advance in the prices of certain sizes of its tires. There has been no change in the dealers' discounts.

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Commodities on Export Conservation List

WASHINGTON, Sept. 21—The following commodities have been placed on the export conservation list and will hereafter require special licenses for exportation:

Metallic aluminum and all articles containing 10 per cent or more (in weight) of metallic aluminum (individual licenses not required to Canada and Newfoundland), bichloride of tin, lead, lead pipe, lead sheet, oxide of tin, radium ores, radium salts, radium luminous compounds, tin salts, sundry articles either made of tin plate or coated or dipped in tin, titanium alloys, titanium compounds, titanium ores, uranium alloys, uranium ores, uranium salts.

Graham W. Brogan has been appointed advertising manager of the Duesenberg Motors Corp., Elizabeth, N. J. He was formerly assistant to the general sales manager.

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A. C. McKibbin has retired as secretary of the Missouri State Highway Board. He retains his position as a member of the State Highway Board.

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Frank H. Ball, formerly engineer of the Penberthy Injector Co., Detroit, has been made manager of the carbureter department of that company.

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C. L. Fox, for 3½ yr. assistant sales manager of the Saxon Motor Car Corp., Detroit, has received an appointment to the officers' training camp at Jacksonville, Fla. He will report for duty about Oct. 1.

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H. S. Ketchum, formerly New England district sales manager for the Cleveland Tractor Co., has been appointed by the McCord Mfg. Co., Detroit, as district sales manager for the Heath-Duplex folding delivery body. He will cover territory extending from Texas in the southwest to Florida in the southeast, and North Carolina in the northeast to Oklahoma in the northwest.

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Frank C. Kip, sales manager of the Motor List Co., Detroit, and at one time sales promotion manager of the Packard Motor Car Co., has entered into Government work. Mr. Kip has been appointed to the Industrial Service Division of the Bureau of Labor Statistics, Department of Labor.

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Ralph J. Handy, former distributer of the Tonford truck attachments in Detroit, has been appointed sales manager of the Lauton Truck Co., Youngstown, Ohio.

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J. L. Hibbard, for 5 yr. associated with the Studebaker Corp. in its sales department, in charge of foreign sales, has been appointed foreign sales manager of the Cleveland Tractor Co.

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W. H. Miller, for a number of years assistant manager of the South Bend Studebaker Corporation, has resigned to accept the position of district representative for the Garford Motor Truck Co., with headquarters at Kansas City.

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H. S. Ketcham has resigned as New England district sales manager for the Cleveland Tractor Company and becomes southeastern and southwestern district sales manager for the Heath Duplex division of the McCord Manufacturing Company, Inc., Detroit.

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John E. Garlent, who has been in charge of motor car production of the Harroun Motors Corp., Wayne, Mich., has resigned to become assistant superintendent of production in the Ordnance Division. His former position has been filled by the promotion of E. Menke, formerly general foreman of automobile assembly.

Men of the Industry

Changes in Personnel and Position

Ellis on War Board

DETROIT, Sept. 23—Guy W. Ellis, formerly sales manager of the Maxwell-Chalmers factory branch, has been appointed secretary of the Wayne County War Board. He is also captain of the 550th machine gun company of the Michigan State troops.

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Bruce A. Ott has been appointed general factory manager in charge of all plants of the Maxwell Motor Co. at Dayton, Ohio. Joseph H. Cooper remains as factory superintendent of Plant No. 1; I. B. Swegles as superintendent of Plant No. 2; J. C. Peil as superintendent of Plant No. 3, and Perry Kreitzer as factory superintendent of plant No. 4.

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S. W. Monroe has been appointed manager of the Detroit branch of the Harroun Motors Corp. He has served the Harroun organization as middle western sales representative since the inception of the company, prior to which he was a district executive for the Maxwell Motor Co.

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J. H. Gould, formerly of the J. H. Gould Co., Detroit, has been appointed chief engineer of the Buffalo Pressed Steel Co.

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Leander J. Hoover, president of the Hoover Steel Ball Co., Ann Arbor, Mich., is dead after an illness of a month. Among the concerns he organized and of which he was president are the King Trailer Co., the Evertight Nut Co., Detroit, and the Fords Products Corp. He also organized the Parker Mfg. Co., manufacturer of chucks and arbors, and was its vice-president. He was also interested in a large number of other smaller concerns.

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George A. Robson, formerly assistant advertising manager of the Chalmers Motor Co., Detroit, is now connected with the service staff of the Detroit *Saturday Night Press*.

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J. E. Grady, sales manager of the Studebaker Corp. of Canada, Ltd., and manager of the Detroit branch, has resigned to become associated with R. T. Hodgkins, vice-president and general manager of the Cleveland Tractor Co., Cleveland.

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J. L. Hibbard has been appointed foreign sales manager for the Cleveland Tractor Co., Cleveland. For the past five years he has been in charge of foreign sales for the Studebaker Corp.

Charles G. Percival, Captain, Ordnance Department, and Post Ordnance Officer, is editor of "The Bomb," which is published at American Military Camp 704, A. E. F.

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Phelps Joins Duesenberg

WAUKESHA, WIS., Sept. 23—Frederick Phelps, Waukesha, Wis., has accepted the position of director of the procurement division of the Duesenberg Motors Co., Elizabeth, N. J., and assumed his new duties Sept. 15. Phelps is head of the Arcadian Spring Co., Waukesha, one of the largest mineral water concerns in the world, which has closed its plant temporarily because of conditions arising out of the war.

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Harroun Directorate Re-elected

WAYNE, MICH., Sept. 23—At the annual meeting of the Harroun Motors Corp., held in Wilmington, Del., the entire directorate was re-elected, including the following: President, John Guy Monihan; vice-president, Ray Harroun; secretary-treasurer, Howard F. Lea; John J. Plath, R. Ward Macey, A. L. Harroun, L. E. Moses, F. W. Vollbrecht, George G. Worthley, L. H. Rogers and Paul Hale Bruske.

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Motor Transport Corps Wants Men

WASHINGTON, Sept. 23—The Motor Transport Corps needs the services of at least 200 men qualified to act as instructors in its training schools. Men of mature age who are either lawyers or teachers are requested to apply. Applicants will be given intensive training for 2 months with opportunities to secure commissions. Men versed in mechanical lines are preferred, but this knowledge is not necessary.

The Corps will open 10 new schools in various army camps shortly which will require 5000 officers, 30,000 noncommissioned officers and 100,000 men, and in these schools the enlisted men will secure intensive special training to fit them for the motor transport work.

Men who feel they can meet the qualifications and who desire to join the Corps, should communicate with the Chief of the Motor Transport Corps, 7th and B streets, Washington, D. C. Minor physical defects will be overlooked in men qualified mentally.

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Expect Rise in Canadian Prices

VANCOUVER, B. C., Sept. 20—An increase of at least 10 per cent in the price of automobiles can be looked for in a very short time, according to the heads of several local automobile concerns. More than one head office has notified its branches to this effect, and it is expected that the increase will affect all the popular makes of cars. Shortage of cars, consequent upon the restriction of the government on raw materials, the scarcity of labor and the bending of the efforts of many companies toward the filling of war contracts are given as the chief reasons for the increase.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Kuenz Radiator Co. Incorporated

DETROIT, Sept. 23—The Kuenz Radiator Co. has been incorporated with a capital stock of $100,000, the manufacturing plant being located in Toledo. The incorporators and officers are: President, J. H. Armstrong, of Cutting, Armstrong & Smith, Detroit, manufacturers of automobile parts; vice-president, J. A. Kuenz; secretary, S. C. Cobin; assistant secretary and general manager, E. C. Shields; treasurer, Charles D. Cutting, also of Cutting, Armstrong & Smith. The company has received a contract for 1500 radiators for De Haviland airplanes, the cost of which approximates $250,000. Work will begin on this order Oct. 1, and is to be completed in 2 months.

Oakland Making Additions

PONTIAC, Mich., Sept. 20—The Oakland Motor Car Co. is erecting two additions, one on each side of the main entrance of the plant. The enlargement is designed to supply more room for lockers for men and women, to provide more office space, and to make possible expansion of the hospital ward. There will also be a lunchroom added for the benefit of workers who carry their lunches. The new quarters will be ready for occupancy within the next 6 weeks, it is expected.

Another Ford Plant Taken by Government

DETROIT, Sept. 23—Arrangements have been completed for the taking over by the Government of the Cincinnati plant of the Ford Motor Co. The plant will be devoted exclusively to the production of war materials.

To Make New Lens

NEWARK, N. J., Sept. 21—Edward S. Schmidt and J. H. Knox, 238 Central Avenue, trading as the S. & K. Specialty Co., have purchased the manufacturing and selling rights for the International lens, which is an anti-glare device for headlamps. It consists of a galvanized iron wire mesh covered with a semi-transparent coating which is non-breakable, waterproof and fireproof. The lenses are fitted inside the ordinary plain glass and sell for 75 cents a pair in any size. The factory is located at Irvington, N. J.

Kales Stamping Expanding

DETROIT, Sept. 19—The Kales Stamping Co., manufacturer of pressed metal parts, is erecting a two-story addition to its factory building on Lafayette Boulevard. The new structure is 47 by 67 ft. and contains 6000 sq. ft. of floor space. It will be used for storage and handling of stock. The work is expected to be completed this month.

Columbia to Make Trucks and Trailer Service Parts

DETROIT, Sept. 21—Production of the initial order of 500 1-ton trucks given the Columbia Motors Co. recently by the government will begin early in October and twenty-five are expected to be completed within the month. The company has also received an order for making all the service parts for the trailers it recently built for the government and also for those produced by other companies.

To Market New Drive

INDIANAPOLIS, Sept. 21—The Positive Drive, Inc., is a company incorporated to market or manufacture an automobile power transmission device invented by William H. Harris, 1226 Central Avenue. The company is capitalized at $60,000, with incorporators named as William T. Rasmussen, Charles R. Yoke and Fred Davis. Other stockholders named in the incorporation papers are Dr. David L. Kahn and Leo Traugott. The device is one for the direct transmission of power to the wheels of automobiles whereby all wheels run at the same time with differential effect at corners and turns. The company may offer the invention on a royalty basis or decide later to manufacture it in Indianapolis.

Dividends Declared

The Michigan Drop Forge Co., Detroit, has declared its regular monthly dividend on common stock, payable Oct. 1 to stockholders of record Sept. 15.

The Willys-Overland Co., Toledo, has declared its regular quarterly dividend of 1¾ per cent on preferred stock, payable Oct. 1 to stockholders of record Sept. 20.

The Chandler Motor Car Co., Cleveland, has declared its regular quarterly dividend of $3 a share, payable Oct. 1 to stockholders of record Sept. 20.

The Hydraulic Pressed Steel Co., Cleveland, has declared the quarterly dividend of 1¾ per cent on preferred stock and 2 per cent on common, payable Sept. 30 to stockholders of record Sept. 20.

The Standard Parts Co., Cleveland, has declared the regular quarterly dividend of 1¾ per cent on preferred stock, payable Oct. 1. Books close Sept. 20.

The Cleveland Automatic Machine Co., Cleveland, has declared a 1¾ per cent dividend on preferred stock, payable Oct. 1 to stockholders of record Sept. 20.

The Portage Rubber Co., Barberton, Ohio, has declared a quarterly dividend of 1¾ per cent, payable Oct. 1 to stockholders of record Sept. 20.

The Goodyear Tire & Rubber Co., Akron, has declared the regular quarterly dividend of 1¾ per cent on preferred stock, payable Oct. 1 to holders of record Sept. 20.

Clutches Coming from Racine

RACINE, WIS., Sept. 23—The Twin Disc Clutch Co. has been organized with an authorized capital stock of $100,000 and is establishing a factory in the former plant of the Racine Auto Tire Co., at Fourteenth and Clark Streets, for the manufacture of clutches and other transmission devices and parts for motor vehicles and tractors. The incorporators include W. T. Shaughnessy, A. Francis, G. F. Garbutt, Julian Olds, J. A. Dietrich and Arthur B. Due, of the law firm of Quarles, Spence & Quarles, Milwaukee. The names of the actual stockholders in the new corporation are not divulged, but it is stated that several men associated with the Modine Mfg. Co., Racine, will have the actual control and management of the business.

To Make Airplane Parts

MILWAUKEE, WIS., Sept. 23—The Lochman-Mayhew High Speed Propeller Co. has been organized at Milwaukee to engage in the manufacture of aircraft and hydroplane parts. Articles of incorporation have been filed and give the capital stock as $1,000, which is to be increased later. The principals in the new organization are Emil R. Lochman, owner of the Lochman Machine Co., and William H. Mayhew, first vice-president of the Mayhew company, cabinet and furniture manufacturer.

Indicator Company Reorganizes

GRAND RAPIDS, MICH., Sept. 20—The Auto Indicator Co. has been reorganized with a capitalization of $50,000. The factory and salesrooms occupy the entire building at 209-217 Ottawa Avenue, northwest, formerly known as the Kent State Garage. The corporation is now manufacturing the Four-In-One Auto Indicator Safety Signal, a safety device for the rear of passenger cars or trucks to warn following cars of the driver's intentions.

The directors of the new corporation are: President, W. W. Huelster; vice-president, I. C. Cilley; secretary and treasurer, Joseph Renihan; general manager, V. I. Cilley; James Ritzema and Dr. E. O. Cilley.

Addition for Detroit Twist Drill

DETROIT, Sept. 21—The Detroit Twist Drill Co. has built an addition to its plant particularly to accommodate the increasing number of women employees. The new structure is 33 x 70 ft. with 6100 sq. ft. floor surface. The first floor will be used for steel storage and receiving room; the second floor for women's locker and lunch rooms and first aid room, and the third floor for the metallurgical laboratory, drafting room and women's instruction room. The building is of reinforced concrete.

Delion Tire Increases Capital

TRENTON, N. J., Sept. 21—The Delion Tire & Rubber Co. has increased its capital from $700,000 to $1,000,000.

Coal Storage Limits Arranged

Fuel Administration Schedules Storage Regulations for Essential Industries

WASHINGTON, Sept. 20—The United States Fuel Administration has arranged a schedule of coal storage for those industries which have been named essential and placed on the War Industries Board preference list. The regulations allow certain numbers of days of storage dependent upon the locality of the industry. There is also a set of regulations for consumers not on the preference list, allowing them a specific number of days storage.

The list is divided into 4 groups—each group comprising the same industries as named in the 4-group arrangement of the War Industries Board preferential list. The manufacturer, as for example a tractor maker, in group 3, with his factory in lower Michigan, will, according to the list, be allowed 60 days coal storage. A tractor maker in Maine will be allowed 105 days storage.

There is no restriction on the stocks of screenings which may be accumulated by either preferential or non-preferential consumers in Ohio, or lower Michigan, and there is no restriction on the stocks of Indiana, Illinois or western coal which consumers may obtain.

Following is the list showing the number of days of coal storage allowed various essential and non-essential industries, this list conforming strictly with the War Industries Board statement of preferential industries:

GROUP 1.

Maine, 135 days.
Massachusetts, Vermont, New Hampshire, Northern New York, 105 days.
Connecticut, Rhode Island, Southwestern New York, 90 days.
Southeastern New York and New Jersey, 60 days.
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida and Western Ohio, 45 days.
Western Pennsylvania, West Virginia, Eastern Kentucky, Eastern Ohio, 35 days.
Lower Michigan, 90 days.

CONSUMERS IN GROUP 2.

Maine, 120 days.
Massachusetts, Vermont, New Hampshire, Northern New York, 90 days.
Connecticut, Rhode Island, Southwestern New York, 75 days.
Southeastern New York and New Jersey, 50 days.
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida, Western Ohio, 40 days.
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 30 days.
Lower Michigan, 75 days.

CONSUMERS IN GROUP 3.

Maine, 103 days.
Massachusetts, Vermont, New Hampshire, Northern New York, 75 days.
Connecticut, Rhode Island, Southwestern New York, 60 days.
Southeastern New York and New Jersey, 40 days.
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida, Western Ohio, 35 days.
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 25 days.
Lower Michigan, 60 days.

CONSUMERS IN GROUP 4.

Maine, 90 days.
Massachusetts, Vermont, New Hampshire and Northern New York, 60 days.
Connecticut, Rhode Island and Southwestern New York, 45 days.
Southeastern New York and New Jersey, 30 days.
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida and Western Ohio, 30 days.
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 20 days.
Lower Michigan, 45 days.

CONSUMERS NOT ON THE PREFERENCE LIST ARE LIMITED TO THE FOLLOWING STOCKS:

Maine, 45 days.
Massachusetts, Vermont, New Hampshire and Northern New York, 30 days.
Connecticut, Rhode Island, Southwestern New York, 20 days.
Southeastern New York and New Jersey, 20 days.
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida and Western Ohio, 15 days.
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 15 days.

7579 Fordsons Sold by One Distributer in 22 Days

DEARBORN, MICH., Sept. 20—E. M. Vanderslice of Tulsa, Okla., distributer of Fordsons, has made a record in the distribution of tractors. He received his appointment as Fordson distributer July 3 and on July 25, only 22 days later, he had booked orders and signed contracts for 7579 tractors. This represents orders valued at $5,500,000. Vanderslice recently visited the factory with a view of urging the company to immediately ship as many tractors as could be had for present distribution. A carload of 300 was started south last week. Because of the protracted drought throughout the south plowing for fall wheat had been impossible until now. This stimulated the demand for farming equipment and caused the Oklahoma State Council of Defense to send Henry Ford & Son a telegram urging the company to start a shipment to this territory as soon as possible. Another urgent call was received from Texas and a carload of 500 was dispatched.

Iron Ore Producers Granted Price Increase

WASHINGTON, Sept. 20—Iron ore producers were granted a slight increase in prices for the quarter beginning Oct. 1 by the price fixing committee of the War Industries Board last night after an all-day conference with representatives of the American Iron and Steel Institute. The extent of the increase was not announced. Decision as to new prices on pig iron was postponed until to-day.

The present price of iron ore is $5.50 a ton, lower lake ports; pig iron $32 a ton and foundry iron $33. Steel prices average about 3¼ cents a pound.

800,000 Tons of Steel Saved by Ford Action

DETROIT, Sept. 20—The suspension of passenger car manufacture at the Ford Motor Co. alone will effect a saving of 800,000 tons of high grade steel for the government. Had production at the plant continued to the limits allowed by the government for the remainder of the calendar year a total of 123,000 cars would have been produced during the last 6 months and each car would have required 1300 lb. of steel.

Standard Contracts for War Work

These Are Designed to Speed Up Production and Guard Against Fraud

WASHINGTON, Sept. 21—Standardized contracts will be used by the War Department hereafter, in so far as is possible, in making purchases. Clauses have been standardized and will be used in every form of contract. They are designed to speed up production, guard against fraud, protect labor interests and assure both the Government and the contractors against legal complications. All previous forms of contracts have been examined and used for compiling the new standardized ones.

To speed up settlements of disputes arising between the Government and the contractor regarding the adjustment of claims which might delay production during the settlement and further to make unnecessary the filing of lawsuits in the Court of Claims, a clause provides the means for the immediate adjustment of all such differences. In the event of the arising of any claims, doubts, or disputes as to the performance or non-performance of the contract which cannot be settled by mutual agreement, the question is placed before the Secretary of War or his duly authorized representative or representatives for adjustment. In the event that the matter is placed before a board, a majority decision of the latter shall be final but permission to appeal directly to the Secretary of War within a limited time is allowed.

The Government retains the right to terminate any contract in the public interest, and if it finds that the need for any contracted supplies no longer exists it can terminate the contract within a specified time. Definite provision is made for the payment of existing stocks and raw materials on hand for the completion of the contract and provision is made for the adjustment of all obligations assumed by the contractor for fulfilling this agreement. Arrangements are also made for the disposal of special facilities provided for the execution of the contract.

Three clauses are devoted to labor. One provides that in the cases specified by law the wages of laborers, operatives and mechanics doing any part of the work contemplated by the contract, in the employ of the contractor, shall be computed upon a basic day rate of eight hours' work, with overtime rates to be paid for at not less than time and one-half time for all time in excess of eight hours.

In the event that labor disputes should arise directly affecting the performance of the contract or delaying its execution, the contractor may appeal to the Secretary of War for adjustment of the difficulty. The contractor is obligated to comply with such adjustment as may be made by the Secretary. If such a settlement involves an increase of wages, thereby placing a burden on the contractor, he will be compensated for the extra outlay. Likewise, in the event of a reduction of labor cost, the amount involved will be deducted from the cost in favor of the Government.

Contractors are obliged to comply with existing state laws and are also obligated not to employ in War Department contracts any minor under the age of 14 years or permit any minor between the ages of 14 and 16 years to work more than eight hours in any one day, more than six days in any one week, or before 6 a. m. or after 7 p. m. The employment of convict labor is prohibited, except in the event of an executive order and then only under the terms of such an order.

On cost-plus contracts provision is made for a rigid inspection of costs and the Government retains at all times the right to make checks and audits on materials and prices as well as setting up machinery of inspection to insure full value received. The accounting books of the contractor are always to be open to the Government's officers. The decision of the Accounting Officer in regard to proper costs shall prevail. The right to appeal directly to the Secretary of War is given to the contractor. The con-

tractor must comply with the ruling that in all cost-plus contracts proposed expenditures for labor and materials shall be approved in advance.

In this connection the War Department will follow its policy that wherever possible fixed price contracts shall be used, but where it is to the advantage of the Government to use a cost-plus contract, a cost-plus fixed compensation contract will be used. All such contracts are subject to review by the Superior Board of Contract Review of the General Staff. The covenant against contigent fees as prescribed by executive direction will be incorporated in the new contracts. In this the contractor expressly warrants that he has not employed a third person to solicit or obtain the contract in his behalf and that he has paid no fee to secure it.

Contractors are obliged to provide protection to their plants against espionage, fire, explosion, acts of war, and acts of enemy aliens. The contractor shall, when required, report to the Government the citizenship, country of birth or alien status of any or all of his employees. The Government retains the right to prevent the employment of suspected persons or to demand their discharge from the employment of the contractor.

If at any time the Government is able to provide materials to the contractor, the latter is obliged to accept them, if he has not already made commitments, arrangements being made for satisfactory compensation.

The various supply bureaus of the Army are now preparing to adopt the new contract form.

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Washington-New York Air Mail Is 100 Per Cent Efficient

WASHINGTON, Sept. 21—The aerial mail service to Washington, Philadelphia and New York has scored 100 per cent daily thus far for September, despite the rainy weather period. The worst day was Sept. 18, when the airplanes left Washington and New York in the midst of storms. The machine leaving Washington had to be started in the hangar, and the landing gear of the plane sank into the mud up to the hubs before making the take-off from the ground. Notwithstanding this weather the trip from Washington to New York was made in 3 hr. and 5 min. The entire journey was made through rain and storm and landings in rain were effected in Philadelphia and New York.

Aviator Max Miller left New York on Sept. 19 for Clarion, Pa., to chart a more favorable route across the mountains in Pennsylvania than is found on the air line from Belmont to Cleveland. He will return from Clarion to-morrow.

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U. S. Rubber to Issue Notes

NEW YORK, Sept. 22—The United States Rubber Co. probably will issue $6,000,000 of 5-year 7 per cent notes. It is understood that the company has applied to the Capital Issues Committee for permission to make the issue. The new notes would be used in connection with the refunding of the $9,000,000 General Rubber Co. debentures due Dec. 1.

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On Export Conservation List

WASHINGTON, Sept. 23—The following commodities have been placed on the Export Conservation list, effective Sept. 24, 1918, and will hereafter require permits for exportation: Cadmium alloys, cadmium compounds, cotton airplane duck, ferrozirconium, zirconium alloys, zirconium compounds, zirconium metal, zirconium ores or concentrates.

Better Bearings for Farm Equipment

Experiments Being Made with Anti-Friction Bearings on Power Farm Equipment

CHICAGO, Sept. 20—Power farm operative equipment fitted with anti-friction bearings will be on the market next year if experiments now under way are completed in time. The new machinery will include both tillage and harvesting equipment. At various implement factories experiments are under way looking toward the early production of plows, cultivators, mowers, binders, threshing machines and other equipment, all with anti-friction bearings in place of the rough or babbitted bearings with which farm equipment of the past has been fitted.

Development in this direction has been made necessary by the demand for heavier and sturdier machines for use behind tractors. Experience has shown conclusively that farm operative equipment of the horse-drawn types will not stand up under tractor farming conditions. The greater speed of the tractor, and the greater concentration of power, together with the strains of continuous work, racked horse-drawn machinery to pieces and made the rapid depreciation on such machines a fact of great economic importance to the farmer.

Most pieces of farm operative equipment are kept for an entire year only to be used for a few days. When needed it is all important that they be in good working condition and that they be able to meet the demands which will be made upon them. With equipment of the old design there has been a loss of time amounting sometimes to as much as 25 per cent for oiling and otherwise preparing the machines for service. Also it developed that where machines, with the crude bearings which have been the rule, were used with tractors, frictional resistance increased tremendously and the machines soon became useless.

While the substitution of roller bearings for the old style bearings will increase the cost of the machines to the farmer to some extent, this will be far more than offset by the saving effected in time and in lengthening the life of the machines. An authority on this subject says that by the substitution of anti-friction bearings for the old style babbitted bearings in a threshing machine, for instance, there will be a saving of 10 hp. on the power required to operate it and a saving of at least four hours per day in oiling and attention. Of course, it is impossible at this time to say to what extent the life of machines will be extended, but it must be obvious that it will be considerable.

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Mexican Oil Exports

TAMPICO, MEXICO, Sept. 21—Complete figures of the oil exportations through the ports of Tampico and Tuxpam for the month of August are now available. The Penn-Mex Fuel Company's shipments did not come up to earlier estimates by about 200,000 barrels, but the total shipments of all the companies through the two ports exceeded the 5,000,000 barrel mark by 36,140 barrels. The exports were as follows:

Huasteca Petroleum Company, 1,563,759; Aguila (Eagle) Oil Company, 709,772; Penn-Mex Fuel Company, 448,724; Freeport Oil and Transportation Company, 448,771; Island Oil Company, 246,300; National Petroleum Company, 56,014; Mexican Gulf Petroleum Company, 258,099; the Texas Company, 177,868; East Coast Oil Company, 331,750; Cortez Oil Company, 309,500; Standard Oil Company, 485,584.

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The Pfalz Single-Seater Fighter

(*Continued from page* 550)

flanges is by gluing only, no tacks or screws being employed. The spar is afterward covered for its entire length by fabric, to prevent moisture from attacking the internal glued joints and to reduce the risk of splitting. The fabric is not wrapped around the spar spirally but is laid on straight, finishing off along one corner of the spar. As in most machines, the spars are not placed with their vertical faces at right angles to the chord line but at right angles to the line of flight.

Reference has already been made to the struts connecting the body with the top plane, and to the fact that these struts are pivoted as shown in an accompanying illustration. A circular base plate is bolted to the body formers where these are crossed by the upper body rails. The base plate has welded to it a cup or socket into which fits a spherical male portion secured to a sheet steel shoe surrounding the lower end of the body struts. A taper pin passing through socket and ball secures the strut in place. The slot through the ball is of elliptical section to allow a certain amount of play for alignment.

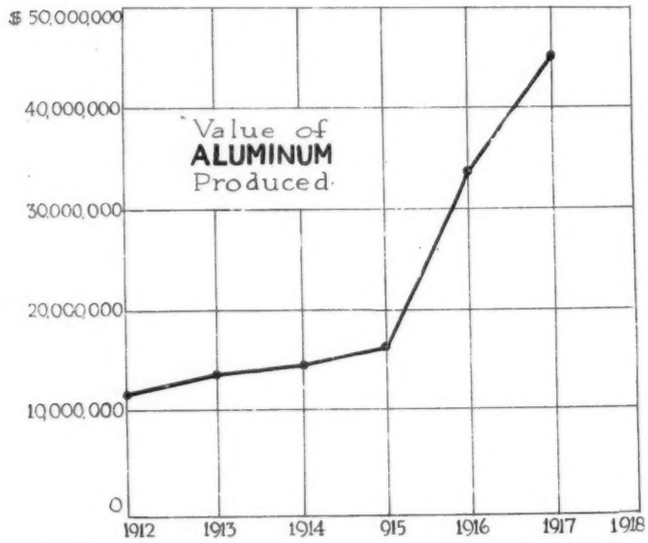
Another sketch shows how the lower spars are attached to the wing roots formed integrally with the body. The fixed spar inside the body is rounded off at its outer end to a circular section. A steel cap surrounds the end of the spar root, to which it is secured, as far as we have been able to ascertain, by a single pin. This cap is surrounded by a collar incorporating a fork for the attachment of the lift cable, and terminates at its outer end in a steel piece shaped like an eyebolt. The inner end of the wing spar is also surrounded by a sleeve, this, however, being secured by two bolts, the inner of which is an eyebolt that serves as an anchorage for the internal drift wiring. The wing spar sleeve carries at its inner end the female portion of the joint, a forked end, which engages with the eyebolt of the fixed spar, the two being held together by a quick-release pin as shown. The ribs have been omitted in the larger drawing for the sake of clearness, but they are indicated in the smaller inset.

(*To be concluded*)

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:
Muriatic, lb. ..... .02-.03
Phosphoric ..... .35-.39
Sulphuric (60), lb.. .009
Aluminum:
Ingot, lb. ..... .33
Sheets (18 gage or more), lb. ..... .40
Antimony, lb. ..... .13¾-.13⅞
Burlap:
8 oz., yd..... .17¼-.17½
10½ oz., yd..... .22 .22½
Copper:
Elec., lb. ..... .26
Lake, lb. ..... .26
Fabric, Tire (17¼ oz.):
Sea Is., combed, lb.1.65-1.70
Egypt, combed, lb.1.25-1.35
Egypt, carded, lb.1.20-1.30
Peelers, combed, lb.1.05-1.20
Peelers, carded, lb. .95-1.05
Fibre (¼ in. sheet base), lb. ..... .50



The annual value of aluminum produced in the United States has increased largely during the past two years. The price is now officially fixed at 33 cents per lb.

Graphite:
Ceylon, lb. ..... .07½-.25
Madagascar, lb. .... .10 -.15
Mexican, lb. ..... .03¾
Lead, lb. ..... .08 -.09
Leather:
Hides, lb. ..... .18 -.35¼
Nickel, lb. ..... .40 -.43
Oil:
Gasoline:
Auto., gal. ..... .24½
63 to 70 gal..... .30½
Lard:
Prime City, gal..2.30
Ex. No. 1 gal....1.60
Linseed, gal. 1.90
Menhaden (Brown) gal. 1.30-1.31
Petroleum (crude),
Kansas, bbl. 2.25
Pennsylvania, bbl.4.00
Rubber:
Ceylon:
First latex pale crepe, lb. ..... .61 -.63
Brown, crepe, thin, clear, lb. ..... .60
Smoked, ribbed sheets, lb. .... .59 -.61½
Para:
Up River, fine, lb. .68
Up River, coarse, lb. ..... .40
Island, fine, lb... .59
Island, coarse, lb. .27
Shellac (orange), gal. .74 -.76
Spelter ..... .09½-.09¾
Steel:
Angle beams and channels, lb. ... .03
Automobile sheet (see sp. table).
Cold rolled, lb..... .06½
Hot rolled, lb..... .03½
Tin ..... .80
Tungsten, lb. 2.45-2.50
Waste (cotton), lb... .12¾-.17

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock	$5.95	$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.
Black Sheet Extras to Apply to Narrow Widths:
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
Ajax Rubber Co	57	60½	—3½
J. I. Case T. M. Co., pfd	81½	90	+ ½
Chalmers Motor Co., com	4	5½	..
Chalmers Motor Co., pfd	20	30	..
Chandler Motor Car Co	84	85	—2½
Chevrolet Motor Co	117	122	+2
Fisher Body Corp., com	35¾	36	— ¼
Fisher Body Corp., pfd	84	87½	..
Fisk Rubber Co., com	60	62	..
Fisk Rubber Co., 1st pfd	97	103	..
Firestone Tire & Rubber Co., com	104½	106½	— ½
Firestone Tire & Rubber Co., pfd	94	96	..
General Motors Co., com	116	117	+1¼
General Motors Co., pfd	77½	78½	— ½
B. F. Goodrich Co., com	45	46	—1½
B. F. Goodrich Co., pfd	99½	101	..
Goodyear Tire & Rubber Co., com	152	155	..
Goodyear Tire & Rubber Co., 1st pfd	99½	100½	..
Grant Motor Car Corp	2¼	3	— ¾
Hupp Motor Car Corp., com	3	3¼	..
Hupp Motor Car Corp., pfd	78	82	..
International Motor Co., com	34	37	+2
International Motor Co., 1st pfd	62	66	..
International Motor Co., 2nd pfd	36	41	..
Kelly-Springfield Tire Co., com	46¼	47½	—1½
Kelly-Springfield Tire Co., 1st pfd	79	87	..
Lee Rubber & Tire Corp	18½	20	—1½
Maxwell Motor Co., Inc., com	25½	26¾	— ⅛
Maxwell Motor Co., Inc., 1st pfd	57	57¾	+ ½
Maxwell Motor Co., Inc., 2nd Pfd	20½	21½	+ ½
Miller Rubber Co., com	106	108	..
Miller Rubber Co., pfd	95	96	..
Packard Motor Car Co., com	117	123	—3
Packard Motor Car Co., pfd	90	93	..
Paige-Detroit Motor Car Co., com	15	17	— ½
Peerless Truck & Motor Corp	13	17	—1
Portage Rubber Co	105	109	..
Reo Motor Car Co	14¾	15¼	..
*Saxon Motor Car Corp	5	7	..

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co	12½	13½	..
Standard Parts	..	62	..
*Stewart-Warner Speed. Corp	58½	60½	+2
*Studebaker Corp., com	45⅛	46⅛	— ⅛
*Studebaker Corp., pfd	85	90	..
Swinehart Tire & Rubber Co	50	60	..
United Motors Corp	28⅛	28⅜	+ ⅛
*U. S. Rubber Co., com	60	61	..
*U. S. Rubber Co., pfd	102¾	104	— ¾
*White Motor Co	43½	45½	—1¾
*Willys-Overland Co., com	19¼	20¼	+ ⅛
*Willys-Overland Co., pfd	81	83	..

*At close Sept. 21. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co	..	7	..
Bower Roller Bearing Co	17½	..	..
Chevrolet Motor Co	116	122	+1
Continental Motor Co., com	5½	..	+ ⅛
Continental Motor Co., pfd	..	..	..
Edmund & Jones, com	..	17	..
Edmund & Jones, pfd	..	90	..
Ford Motor Co. of Canada	148	150½	—2
Hall Lamp Co	..	14	..
Michigan Stamping Co	..	..	..
Packard Motor Car Co., com	116	120	..
Packard Motor Car Co., pfd	90	92½	..
Paige-Detroit Motor Car Co	15¾	17	..
Prudden Wheel Co	10¼	10¾	..
Reo Motor Car Co	14⅝	15	..

INACTIVE STOCKS

Atlas Drop Forge Co	..	25	..
Kelsey Wheel Co	25	..	..

Control of Moline to Overland

Plow Company to Be Operated as Separate Concern—To Build Tractors in Toledo

TOLEDO, Sept. 25—The Willys-Overland Co. has obtained control of 51 per cent of the stock of the Moline Plow Co., Moline, Ill., which manufactures the Moline-Universal tractor and an extensive line of other farm implements. It is the plan of the Willys-Overland company to retain the Moline company practically intact except that Vice-President and General Manager Frank G. Allen will become president and general manager.

The Moline company will be operated as a separate organization, and according to John N. Willys no merger is contemplated, nor will there be any change in the financial status of the Moline company.

It is planned eventually to concentrate all manufacture of tractors at Toledo, and to this end the production of tractor engines will be commenced there at once. Steps are now being taken to transfer some of the machinery and manufacture of engines will be begun soon on a large scale. Within a year the entire tractor will be built in the Toledo shops, with the Moline and other shops to be devoted to the production of agricultural implements. The Moline company has eight plants, located in Moline, Chicago, Rock Island, Freeport, Poughkeepsie, Stoughton, Wis., and Minneapolis.

The Moline company was established in business in 1865 and incorporated as the Moline Plow Co. in 1870. In 1906 the Mandt Wagon Co., Stoughton, Wis., and the Henny Buggy Co., Freeport, Ill., were acquired. In 1909 the Monitor Drill Co., Minneapolis, was taken over, and in 1911 the Acme Steel Co., Chicago, and in 1912 the Adriance-Platt Co., Poughkeepsie. In the spring of 1916 the company commenced production of passenger cars, using one of the new factories at Freeport. In the fall of 1915 the business, good will and patents of the Universal Tractor Co. were acquired and a factory erected in Rock Island for their production.

The Moline company is capitalized at $21,000,000 common, $7,500,000 7 per cent cumulative first preferred and $1,500,000 non-cumulative second preferred. Late in August an issue of $6,000,000 serial notes was placed on the market.

At the time of the sale of these notes it was stated that the company's sales for the 11 months ending July 31, 1918, totalled $17,315,036, as compared with $13,140,450 for the preceding 12 months. At no time in its history has the Moline company been physically able to supply the demand for tractors. At the present time the production is running 54 a day and the company is 4800 machines in order.

It is likely that the selling forces of the Overland and Moline companies will be combined. The Moline company has 22 branch houses and 30,000 dealers. The Overland company has more than 100 distributers and 8000 dealers.

The acquisition of the Moline company places the Overland company in a position where it is able to supply its representatives not only with passenger cars and motor trucks, but with tractors and also with airplanes. The latter includes the control of substantial interests in the Curtiss Aeroplane & Motor Corp., Buffalo, thus making the automotive field complete in so far as Overland is concerned.

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Truck Curtailment Protest

(*Continued from page* 554)

war essentials, and that their production for such purposes must be facilitated; and furthey that in so far as motor trucks are employed in civilian industries for essential uses they constitute an important transportation medium, and any curtailment of such uses should be avoided as far as practicable."

As was shown in meetings previous to the issuance of this circular, more than 80 per cent of the truck consumers in this country are engaged in what can be called direct or indirect war work, or essential civilian industries. Consequently, the raising of this question of the essentialness of the motor truck by the War Industries Board at this time seems unreasonable to the truck makers. They declare that the essentialness of the truck has been proved and accepted by the War Industries Board.

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Glover Heads Motor Division

(*Continued from page* 554)

The district offices organization includes the Chicago office, under Major M. B. Edgerton; Cleveland, under Captain D. S. Devore; New York, under Major E. L. Jaco, and Detroit, under Major G. D. Wilcox.

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Fair Success Follows Chicago Show

CHICAGO, Sept. 23—A fair degree of success from a standpoint of accessory business, a failure from a standpoint of general attendance and from truck and tractor business, is the only conclusion that can be reached regarding the Second Annual National Truck, Tractor and Accessory Exposition, which closed Saturday night after a run of a week at the Municipal Pier. A large proportion of the accessory exhibitors expressed themselves as being quite satisfied with the business results obtained. Many of them found a better business than they anticipated.

This seeming paradox of good business for many of the accessory dealers and a discouragingly small attendance comes about through the fact that the show was staged expressly for jobbers and dealers and set at a time when the jobbers and dealers are closing up their accessory lines for the coming season. Inasmuch as it appealed to the trade, the fact that there were not many people there who were solely sightseers, from whom nothing could be expected more than a few retail orders, the lack of a crowd made it possible for those who came there direct for business to make their inspection of the different lines and conduct their negotiations without the jam of people with which we are accustomed to find the aisles crowded at the national shows.

The one truck exhibitor who sold a truck at the show said the sale was the result of a lead he had gotten outside and that the prospect came in at his telephoned request, although the opportunity of showing the truck at the Pier to the prospect permitted him to close the deal.

Foote Bros., exhibiting a planetary transmission for tractors, were the only people in the truck and tractor business that found the show worth while. They said the show gave them an opportunity to get some good factory prospects that they might not have gotten otherwise.

Opinions among the accessory exhibitors are divided. Those who exhibited with general publicity as one of the principal reasons were sadly disappointed, because the public was not on hand.

Tax Plan Unchanged by Congress

Some Knots Regarding Tax on Used Cars Untangled—Each Buyer Must Pay Impost

WASHINGTON, Sept. 19—There has been no change in the proposed tax on passenger cars, trucks and gasoline in the new revenue bill, although there has been considerable discussion on the part of the House regarding the tax.

Some suggestions have been received by congressmen in favor of a yearly tax on the use of passenger cars based on their value instead of on the horsepower and suggesting the use of the used car lists used by the Chicago Automobile Trade Association as the basis of taxation. In discussion of the tax Congressman Treadway explained that the yearly tax will not apply to an automobile owned by an individual and left in the garage unused during the entire year, because the bill specifies that the tax will be collected on the use of automobiles.

Congressman Ellsworth stated that a number of dealers in used cars complained that under the horsepower tax plan a $200 machine will pay the same tax as a $5,000 one. Congressman Kitchin explained that while the machine is in the hands of the dealers for repairs, equipment or resale it is not subject to the tax, but as soon as it is purchased by an individual for his use and is used he will have to pay the license tax and not the sales tax. It was also explained that if automobiles changed hands four or five times in the course of the year each new user would have to pay the yearly license tax.

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New Directors for Standard Aircraft

ELIZABETH, N. J., Sept. 25—Joseph A. Bower, vice-president of the Liberty National Bank of New York, and Henry J. Fuller, vice-president of the Fairbanks-Morse Co., have been elected directors of the Standard Aircraft Corp. and the Standard Aero Corp. of New York.

Bureau of Aircraft Purchases

WASHINGTON, Sept. 20—Following is a list of purchases contracted for by the Bureau of Aircraft Production:

Aug. 22, 1918

Dayton-Wright Airplane Corporation, Dayton, Ohio, spares for planes.
Tennessee Valley Iron & Railroad Co., Collinwood, Tenn., wood.
Frank P. Jones, 807 Liberty Building, Philadelphia, Pa., lumber.
Standard Aircraft Corporation, Elizabeth, N. J., lumber.
William Whitman & Co. (Inc.), 25 Madison Avenue, New York City, balloon cloth.
The Lawton Mills Corporation, care of E. N. Morris, P. O. Box 1057, 86-88 Worth Sreet, New York City, balloon cloth.
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.
Coventry Co., Anthony, R. I., balloon cloth.
West Woodworking Co., 308 North Ada Street, Chicago, Ill., propellers.
Standard Aircraft Corporaion, Elizabeth, N. J., airplane.
Splitdorf Electrical Co., 98 Warren Street, Newark, N. J., magneto parts.

Aug. 24, 1918

Dayton Wright Airplane Co., Dayton, Ohio, spares for planes.
Gray Tractor Co., (Inc.), Minneapolis, Minn., spare parts for tractors.
F. S. Webster Co., 332-342 Congress Street, Boston, Mass., typewriter ribbon cloth.
A. H. Wells & Co., Waterbury, Conn., copper tubing.
Cyclemotor Corporation, Rochester, N. Y., engine spares.
Howell & Lesser, San Francisco, Cal., airplanes.
U. S. Aircraft Corporation, Red Wood City, Cal., airplanes.
Livingston Radiator & Manufacturing Co., New York, N. Y., radiators.
Union Switch & Signal Co., Swissvale, Pa., engines and spares.
Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., reimbursement erecting and equipping building at Buffalo.

Aug. 26, 1918

Whittaker-Glessner Co., Portsmouth, Ohio, steel drums.
Liberty Iron Works, Sacramento, Cal., airplanes.
Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., spares for planes.
American Propeller Co., Baltimore, Md., propellers.
The Marlin-Rockwell Corporation, New York, N. Y., radiators for planes.
Splitdorf Electrical Co., Newark, N. J., engine spares.
Jones Metrola (Inc.), 29-31-33 West Thirty-fifth Street, New York City, N. Y., tachometers.
Burke & James (Inc.), 240-258 East Ontario Street, Chicago, Ill., camera turret suspensions.

Aug. 27, 1918

Oxygen Gas Co., Kansas City, Mo., hydrogen gas.
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., finished balloon cloth.
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.

Contracts

Aug. 28, 1918

Wright-Martin Aircraft Corporation, New Brunswick, N. J., engine spares.
Russell & Cowles, 99 Johns Street, New York, N. Y., motor boat.
Field Mfg. Co., Owosso, Mich., crating machine shop truck bodies.
Willard Storage Battery Co., Cleveland, Ohio, batteries.
Electric Storage Battery Co., 1823-33 L Street, N.W., Washington, D. C., batteries.
Sperry Gyroscope Co., Brooklyn, N. Y., air compasses.

Aug. 29, 1918

The Wood Mosaic Co., New Albany, Ind., lumber.
Amos Lumber Co., Edinburg, Ind., lumber.
Park Drop Forge Co., Cleveland, Ohio, crankshaft forgings.
Livingston Radiator & Mfg. Co., Seventy-fifth Street and Amsterdam Avenue, New York, N. Y., radiators.
Union Switch & Signal Co., Swissvale, Pa., engines.
Standard Gauge Steel Co., Beaver Falls, Pa., connecting rods.

Aug. 30, 1918

Breese Veneer Co., Keneva, W. Va., lumber.
John A. Roebling's Sons Co., Trenton, N. J., balloon cable.
American Steel & Wire Co., 30 Church Street, New York, N. Y., balloon cable.
Union Switch & Signal Co., Swissvale, Pa., services and material in repairing engines.
Niagara Motors Corporation, Dunkirk, N. Y., engine spares.
Ford Motor Co., Detroit, Mich., cylinders.

Aug. 31, 1918

The Burd High Compression Ring Co., Rockford, Ill., engine spares.
Trumpbour-Whitehead Brass & Copper Co. (Inc.), Canal, Mercer and Howard Streets, New York, N. Y., copper radiator tubes.
Eastman Kodak Co., Rochester, N. Y., drum-developing machine.

Sept. 3, 1918

The Wright-Martin Aircraft Corporation, New Brunswick, N. J., camshafts.
Wright-Martin Aircraft Corporation, New Brunswick, N. J., engine spares.
Cincinnati Milling Machine Co., Cincinnati, Ohio, milling machine and attachment.
The Steel-Alderfer Co., Cuyahoga Falls, Ohio, lumber.
Burd High Compression Ring Co., Rockford, Ill., piston rings.
Burd High Compression Ring Co., Rockford, Ill., piston rings.
Burd High Compression Ring Co., Rockford, Ill., piston rings.
The Hess-Bright Mfg. Co., Philadelphia, Pa., engine spares.

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Quartermaster Purchases

WASHINGTON, Sept. 20—Following is a list of contracts placed by the Quartermaster Department:

Aug. 24, 1918.

Chicago Flexible Shaft Co., Chicago, Ill., spare parts.
Haverford Cycle Co., Philadelphia, Pa., bicycles.
Kniffin & Demarest Co., New York City, lantern globes.
Emerson - Brantingham Implement Co., Rockford, Ill., tractors.

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Navy Supply Bureau Contracts

WASHINGTON, Sept. 20—Following is a list of contracts placed by the Bureau of Supplies and Accounts of the Navy:

Aug. 23, 1918

Goodyear Tire & Rubber Co., Akron, Ohio, dynamite gas valves.

Aug. 24, 1918

Goodyear Tire & Rubber Co., Akron, Ohio, training students.

Aug. 30, 1918

J. B. Swomball Co. (Ltd.), Chatham, New Brunswick, aeroplane spruce.
O'Brien (Ltd.), Nelson, New Brunswick, aeroplane spruce.
Geo. Birchill & Sons, South Nelson, New Brunswick, aeroplane spruce.
J. B. Ritchie Co., New Castle, New Brunswick, aeroplane spruce.
Shires Lumber Co., Campbellton, New Brunswick, aeroplane spruce.
Fraser Lumber Co., Edmeston, New Brunswick, aeroplane spruce.
Richards Lumber Co., Campbellton, New Brunswick, aeroplane spruce.
Wm. Rutherford & Son, Montreal, Quebec, aeroplane spruce.
Geo. B. Goodfellow, Montreal, Quebec, aeroplane spruce.
Colonial Lumber Co., Pembroke, Quebec, aeroplane spruce.
P. Q. Lumber Co., care of Geo. B. Scott, 705 Sears Bldg. (Dalhousie, New Brunswick), Boston, Mass., aeroplane spruce.
United States Light & Heat Corp., Niagara Falls, N. Y., batteries.

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Army Engineer Depot Places Contracts

WASHINGTON, Sept. 18—The following contracts were placed by the General Engineer Depot of the Army:

Aug. 23, 1918

International Harvester Corp., Chicago, Ill., tractors.
Ford Motor Co., Detroit, Mich., parts for searchlight carriages.
Adams & Westlake Co., Chicago, Ill., switch lamps.

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Hart-Parr Brake Tests

CHASE CITY, IOWA, Sept. 21—The Hart-Parr 30 tractor at the Salina National Demonstrations in the brake horsepower test on the prony brake carried a load of 31.13 brake horsepower for 30 min. The engine speed during this official trial averaged 731.8 r.p.m. This test was made with the thermometer at 109 deg. Fahr. in the shade.

Calendar

ENGINEERING

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

SHOWS

Sept. 23-28—Boise, Ida. Tractor demonstration (State Fair). J. C. Wooley, Moscow, Ida.

Oct. 1-5 — Washington, Ga. (Wilkes Co.). Tractor demonstrations, State Fair.

Oct. 12-19 — Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20 — Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

RACING

Oct. 5 — Cincinnati. Cincinnati Speedway.